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O and M Considerations in the Construction Grants Process: Participant Handbook

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National Training and Operational Technology
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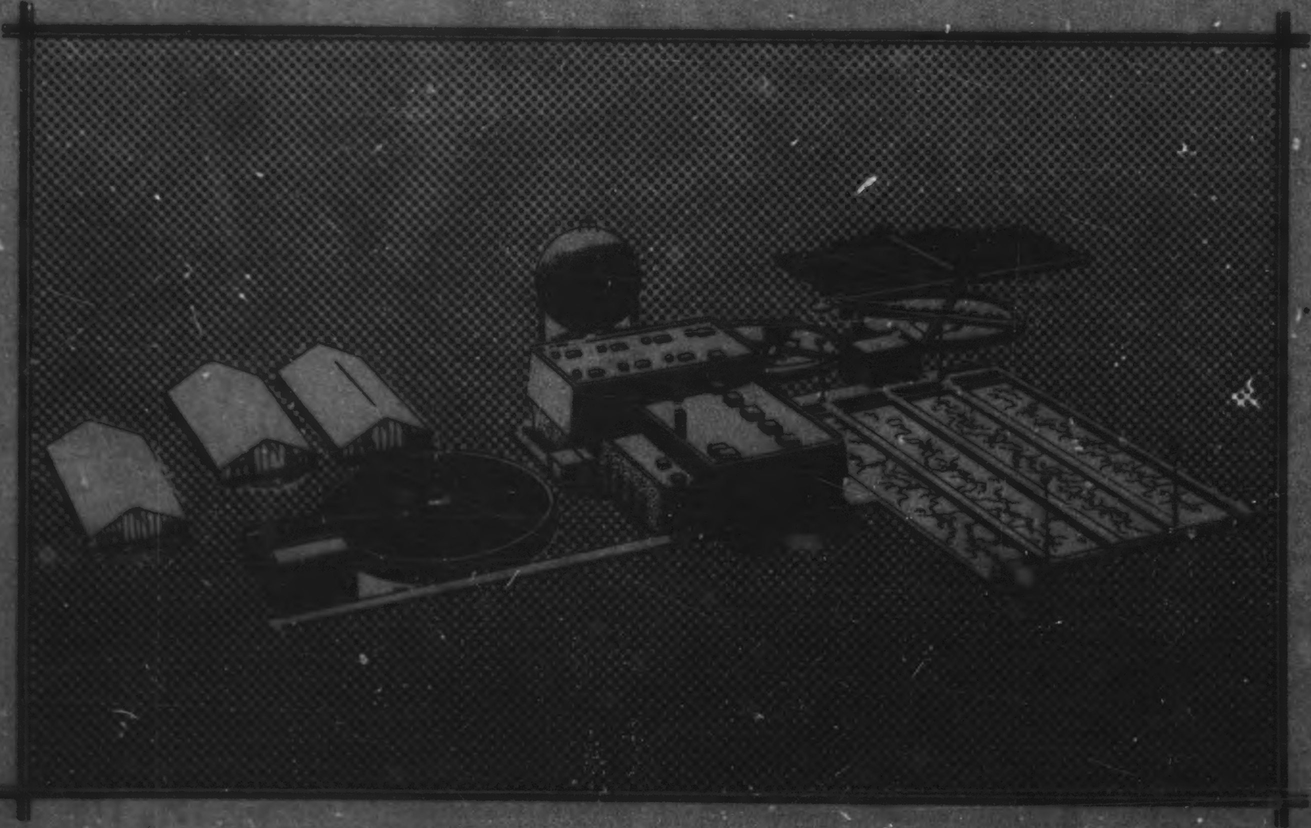
Participant Handbook



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Designed for a 3½ day course on O & M Considerations in the construction grants process, this handbook outlines procedures in the USEPA Construction Grants Program which should be taken to achieve improved operation and maintenance of wastewater treatment facilities. Individual chapters deal with: O & M Considerations in Steps 1, 2, and 3 of the Construction Grants Process, Start-Up Services, and O & M Concerns in Inspections.

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O&M CONSIDERATIONS IN THE CONSTRUCTION GRANTS PROCESS

PARTICIPANT HANDBOOK

Prepared for:

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Cincinnati, Ohio 45268

Under Training Grant No. T-901-051-010

by

Water and Wastewater Training Division

In cooperation with

Vocational Industrial Teacher Education Division

Texas Engineering Extension Service
The Texas A&M University System
College Station, Texas 77843

DISCLAIMER

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FOREWORD

This handbook is designed as a supplement to the 3 1/2 day training course titled, "O&M Considerations in the Construction Grants Process."

It is to be used by the participant:

1. To facilitate understanding of materials covered in class
2. As a reference following completion of the course
3. As a handbook for the course
4. As a guide for the review of O&M manuals

The information provided in this handbook is of primary importance to individuals involved in reviewing and approving facility plans, plans and specifications, O&M manuals, change orders, start-up services, and the plan of operation.

In addition to this manual, the associated instructor's manual titled "O&M Considerations in the Construction Grants Process" (EPA-403/1-80-003, May 1980), a checklist, handouts, and visual materials (referenced in the instructor's manual) are also part of the course package.

INTRODUCTION

The Water Production Control Act (PL 84-660) was passed by Congress in 1956, and amended in 1972 (PL 92-500). In 1977 the Clean Water Act (PL 95-217) was passed. These laws provide for extensive involvement and support by the federal government in funding wastewater treatment systems. The Environmental Protection Agency (EPA) has the responsibility of implementing these laws.

Over the past 25 years about 20 billion dollars in federally funded construction grants programs have been spent to build new wastewater treatment facilities. It is estimated that nearly 50 percent of these facilities are not meeting their original design objectives. This continuing trend of poor performance must be corrected if point source pollution is to be controlled.

A variety of factors contribute to the problem. This handbook addresses these factors and describes specific steps that must be taken in the construction grants program to achieve improved operation and maintenance of wastewater treatment plants.

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COURSE INTRODUCTION

UNIT
1

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UNIT ONE

OBJECTIVES

Following the Unit One presentation, the participant will be able to:

1. Identify those agencies or groups concerned with pollution control and describe their activities in this area
2. Discuss O&M requirements as defined by:
    a. Regulations
    b. Guidelines
    c. Program requirements memoranda
3. Demonstrate the use of O&M checklists

UNIT ONE

OUTLINE

I. COURSE INTRODUCTION 1- 4

II. CONSTRUCTION GRANTS PROGRAM OVERVIEW 1- 6

- A. O&M Requirements as Defined by:
  1. Statutes and regulations
  2. Guidelines
  3. Program requirements memoranda
- B. O&M Checklist
  1. Need
  2. Functions
  3. Benefits
  4. Use

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COURSE INTRODUCTION

The Environmental Protection Agency was created by Congress in 1970 and was given the responsibility of administering PL 92-500. The EPA, in turn, delegated certain program functions which include: (1) review and approval of plans and specifications, (2) review and approval of O&M manuals, (3) review and approval of permit programs, and (4) review and approval of start-up procedures. EPA will accept state certification of the above functions. These functions have not been delegated to all states. Some states have not accepted the functions which have been delegated to them.

The results of efforts of the federal government and states in preventing water pollution have been disappointing. Despite the enormous amount of money, work, and effort spent over the past two decades, almost 50 percent of all newly constructed treatment facilities are not operating in accordance with their original design objectives.

This continuing trend of poor performance is of great concern. It must be reversed if the construction grants program is to meet the goal of controlling point source pollution. Certain actions can be taken through the grants program that will reverse this trend of poor performance and failure to meet discharge permits.

The National Training and Operational Technology Center is developing a series of training courses in support of ongoing activities to delegate construction grant program authority to state agencies under Section 205(g) of the Clean Water Act. Actual course offerings under this program began in September of 1979, and will continue at least into FY 81. In addition, a project has been initiated to develop a long-range plan for effectively responding to the unique and changing training needs of state agencies as they assume greater responsibility for managing the construction grant program. This training effort is continually coordinated with Headquarters Office of Water Program Operations program offices and Regional offices.

O&M Requirements

Proper operation and maintenance of federally funded facilities, including but not limited to wastewater treatment facilities, pumping stations, interceptor sewers, force-main sewers, and all other grant fundable items, is a longstanding program requirement which can be found in the statutes, regulations, guidelines, and program requirements memoranda.

The law states that no grant shall be awarded unless the applicant has made provisions for operation and maintenance of such works. The law also requires employment of trained operators to ensure proper operation and maintenance of the treatment works. This must be carried out in accordance with a state approved plan of operation. Therefore, both the state and grantee are charged by law to ensure proper operation and maintenance.

Other operation and maintenance program requirements will be found in the Code of Federal Regulations (CFR). As in the law, the CFR requires the grantee to operate and maintain the treatment works properly and efficiently. Other O&M program requirements include the development of an operation and maintenance manual, emergency readiness, operational reports, proper and efficient operation and maintenance of both treatment works and sewer collection systems, adequate O&M budgeting, and laboratory testing facilities. The grantee, by accepting the grant, agrees to fulfill all of the O&M program requirements. Failure to do so may cause the grant to be revoked. In addition the grantee may be liable for federal funds spent. The states also have a responsibility toward proper and efficient operation and maintenance of treatment works. The states are responsible for the postconstruction O&M evaluation of the treatment works. This evaluation is conducted to ensure that the grantee is operating and maintaining the facility properly. Without assurance of this evaluation, no grant may be awarded. The states and the grantee are charged with the proper and efficient operation and maintenance of wastewater treatment works; the state with a monitoring program and the grantee through proper operation and maintenance of the facility.

O&M
GUIDELINES

To ensure that proper O&M procedures will be followed, guidelines have been developed, for use by agencies involved in the construction grants program. The federal guidelines provide technical information and instructions for a successful grants program. Most of these guidelines make some mention of operations and maintenance. However, there are specific guidelines designed for operation and maintenance which stress reliability, operability, flexibility, and maintainability. They also address inspection, staffing and training, adequate laboratory control and records, safety, maintenance management programs, and financial responsibility. As the course progresses, these guidelines will be discussed in greater detail. Guidelines should be updated as new and proven technical data is developed.

To assure national uniformity and to provide policy direction in the construction grants program, EPA has issued numerous program requirements memoranda (PRM). These are designed to inform construction grants program personnel of policy direction in integrating the requirements of the program.

For the purpose of operation and maintenance, we are mainly concerned with PRM 77-2, Grant Eligibility of Start-up Services, and PRM 77-3, Plan of Operation for Municipal Wastewater Treatment Facilities. These provide information on grant eligibility of start-up services and the plan of operation. The purpose of these PRM's is to assure that the municipal treatment works will achieve operational objectives quickly and effectively. The plan of operation should identify specific actions and completion dates of such actions. Start-up services should help achieve operational efficiency as soon as possible. From time to time, PRM's may be updated or replaced.

In conclusion, any individual or agency involved in the construction grants program review process should be aware of the O&M requirements as defined by the statutes, regulations, guidelines, and PRM's. These requirements will be updated as new technical data and on-the-job experience is acquired. More emphasis on operation and maintenance requirements is needed in the construction grants process.

O&M Checklist

A good usable checklist is an important part of the construction grants review process. The reviewer can use this checklist to ensure that all required O&M items have been considered in the construction grants process. The checklist will enable the reviewer to know when and where the required O&M concerns are to be discussed.

An operational review checklist is a useful tool in the grants program. The reviewer and the grantee will benefit greatly from the use of a checklist. The grantee will know if all O&M requirements are included in each step of the construction grants process. The reviewer will have documented proof that the operational reviews were conducted. In addition, the reviewer will be able to verify what was covered at a conference or what was included or omitted in an application.

A checklist is a useful tool in conducting the review process. However, once it has been determined that all O&M requirements have been considered, the reviewer must rely on his/her expertise to conduct a valid review. The use of a checklist is not intended to be a "rubber-stamp-approval process." It is intended to be used as a tool to aid the reviewer in the review process.

The following example is from the Facility Plan Review, Operation Checklist:

	YES	NO	NA
Have existing facilities, as an alternative or supplement to construction of new facilities, been evaluated based on improved effluent quality attainable through optimum operation and maintenance?	____	____	____

The reviewer determines if such action has been taken. A check is then placed under Yes or No. If there is no existing facility, a check is placed under NA.

CONSTRUCTION GRANTS PROCESS REVIEW

Prior to the start of the construction grants process, each state will have established some type of pollution abatement plan, and will have prepared a water quality management plan. These plans are commonly called basin plans. From these basin plans, each applicant can determine what level of treatment (effluent limitation) is required.

In addition to the basin plans, the state may develop areawide treatment management plans (also known as 208 plans). These plans are for areas with a serious pollution problem and include both point and nonpoint source pollution. The plan usually designates one or more agencies to implement its recommendations. Basically, only those agencies designated in the plan are eligible for grant assistance (except for 109 B and discretionary funds). States must also develop a priority list for the abatement of point source pollution. This list is based upon:

1. Severity of the pollution problem.
2. Population affected
3. Preservation of water quality
4. National priorities
5. Other factors

Only projects certified by the state as priorities will be considered for grant approval (except 109 B and discretionary funds). The continuous process of state planning is designed to eliminate pollution from the nation's waters.

The construction grants program is divided into three independent steps. Each step is closely related to each of the other steps. In the absence of one, progress to the next step is not possible. In addition, approval of one step does not assure approval or acceptance of the next step.

Step 1 is the planning step. During this phase the facility planning process begins with a plan of study. This plan outlines the work to be done in preparing a facility plan. Next, a preapplication conference explains the construction grants program and its requirements. The application is then submitted for approval. After the grant is awarded, a facility plan is developed.

Following approval of Step 1, the applicant proceeds to Step 2, the design phase. (Although Step 1 has been approved, this does not obligate EPA to fund Step 2 or Step 3.) There are numerous program requirements which must be met before Step 2 is approved.

Step 3 is the construction phase. During construction, several inspections are made to ensure proper construction of plants in accordance with approved plans and specifications and safety and storage of materials. During Step 3, the final plan of operation, O&M manual, user charge, industrial cost recovery, sewer use ordinances, and start-up services must be submitted and approved. A final inspection is required prior to final payment. After this payment is made, a final audit is conducted. When all of the above is completed and in compliance, Step 3 is concluded.

Followup is required after Step 3. States are required to inspect treatment works periodically for evidence of compliance with permit requirements and to evaluate procedures.

It should be noted that Step 2 and Step 3 may be combined into one grant application. However, the grantee is still responsible for meeting all O&M requirements for Step 2 and Step 3 grants.

The construction grants process takes place in three steps. The review process is required in all steps. One of the problems with this approach is that many different people become involved in the review process. For instance, someone reviewing Step 2 may be referred to page 41A of the facility plan. If this reviewer did not participate in the Step 1 process, then any referral could present a problem. Whenever possible the same personnel should be involved from the beginning to the end of the construction grants process. If not, then it should be a minimum requirement that the same reviewers (when possible) attend all of the conferences (pre-application, predesign, and preconstruction).

In conclusion, the construction grants program addresses operation and maintenance considerations. Inadequate consideration of operation and maintenance has occurred in the past. Becoming aware of O&M considerations is the first step in correcting this problem. It is important to implement these considerations throughout Steps 1, 2, and 3 and in the preapplication, predesign, and preconstruction conferences. Training is required to develop an understanding of these considerations.

O&M
CONSIDERATIONS
STEP 1
CONSTRUCTION GRANTS PROCESS

UNIT
2

2-1

UNIT TWO

OBJECTIVES

Following the Unit Two presentation, the participant will be able to:

1. Identify and discuss Step 1 of the Construction Grants Process.
2. Explain the importance of operation and maintenance requirements in Step 1 of the Construction Grants Process.
3. Determine and discuss where operation and maintenance must be stressed in three specific phases prior to Step 1 of the Construction Grants Process:
    a. Preapplication Conference
    b. Plan of Study
    c. Facility Plan
4. Recognize and discuss possible problems if operation and maintenance is not considered in Step 1 of the Construction Grants Process and explain how these problems can be avoided.
5. Utilize the Preapplication O&M Consideration Checklist, Plan of Study Review Operation Checklist, and the Facility Plan Review Operation Checklist when conducting an operation review.

UNIT TWO

OUTLINE

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  A. State Planning Process
  B. State Priority System
  C. Preapplication Conference
  D. Clearinghouse Review (A-95)
  E. Plan of Study
  F. EPA Application Form 5700-32
  G. State Priority Certification
  H. Selection of Professional Engineer
  I. Effluent Limitations
  J. Alternatives
  K. Infiltration/Inflow Analysis
  L. Sewer System Evaluation Survey
  M. Public Input
  N. Cost Effective Analysis
  O. Selected Alternative
  P. Review, Certification, and Approval of Plans

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  A. Preapplication Conference
  B. Plan of Study
  C. Facility Plan

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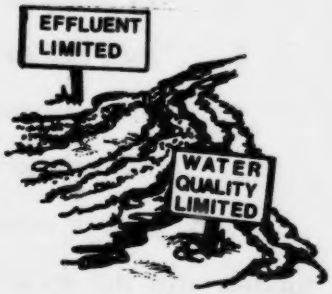
OVERVIEW OF THE STEP 1 PROCESS

State Planning Process

Public Law 92-500 requires each state to establish and maintain a continuing planning process. This planning process must be reviewed and approved periodically by the EPA. It must be consistent with the law and must include the following:

1. Section 303(e) plans (more commonly known as river basin plans or waste load allocation plans)
2. Areawide waste treatment management plans (more commonly known as 208 plans)
3. The state priority list



River basin plans 303(e) establish the water quality standards for each segment or body of water within the river basin. Segments are classified as "effluent limited" or "water quality limited." On "effluent limited" stream segments, all sewage treatment works shall provide a minimum of secondary treatment. On "water quality limited" stream segments, all treatment works must provide a higher degree of treatment in order to meet water quality standards.

This classification is the first indication of the scope of operation and maintenance to be encountered when the plant is put into operation. The stream segment classification should alert state, federal, and local groups to the complexity of O&M requirements, costs, and importance in the planning, designing, constructing, and operating of future plants in that particular stream segment.

Areawide waste treatment management plans (208) are usually prepared for urban-industrial areas. These areas normally have problems with water quality control due to a concentration of people and industries.

State Priority System

The states must prepare a municipal discharge inventory which rates or ranks all of the significant discharges within the state. This inventory must be considered with the stream segment 303(e) priority ranking. The state then develops a system of ranking projects for funding. This system of ranking gives consideration to:

1. The severity of pollution problems
2. The existing population affected
3. The need for preserving high quality water
4. National priorities
5. Any additional factors considered significant by the state

This project priority list represents projects which are anticipated to be funded with the state's allocation of construction grant monies.

A public hearing on the priority list must be held. At this hearing, communities concerned with the funding of a project may make their interest known. Large numbers of prospective grantees are present at this hearing. It offers an opportunity for state construction grant personnel to emphasize that, while the federal government is providing 75 percent of the funding to build the facility, monies for proper operation and maintenance of the facility must be budgeted by the grantee.

PUBLIC HEARING

Preapplication Conference

An applicant is usually unfamiliar with the requirements and/or limitations of the construction grants program. Federal regulations encourage preapplication conferences with the applicant and with state and regional EPA representatives. This conference sets the stage for a good working relationship. It involves applicants who are on the state priority list. While this step is optional, its importance cannot be overemphasized.

This conference offers another opportunity for state and regional officials to stress that good planning, design, and construction are of little value if O&M considerations are neglected.

Clearinghouse Review (A-95)

This system is established to provide for early contact between applicants and all interested governmental agencies. It is important that the project has the approval of all parties concerned. Copies of the comments of all interested parties must be included in the application package.

Plan of Study

A plan of study outlines the work involved in the preparation of a facility plan. This is the first element of the grant request that must be submitted by the applicant. The plan of study should describe briefly the scope, schedule, and costs of the proposed facility plan.

EPA Application Form 5700-32

EPA Form 5700-32 is the formal application document.

State Priority Certification

This document certifies that the applicant is on the state priority list.

Selection of a Professional Engineer

Although the reviewer is not responsible for the selection of a consultant and/or contractor, the grantee should be encouraged to investigate the following:

1. Specialized experience and technical competence of the engineering firm and its staff
2. Past record of performance in fulfilling contracts
3. The firm's capacity to perform the work within time limitations (the firm's current workload must be considered)
4. The firm's familiarity with types of problems applicable to the project
5. No indication of conflict of interest
6. Philosophy on community development
7. The engineer's previous proposals
8. Other facility plans developed by the A/E firm
9. Other facilities under construction
10. Cost overruns
11. Change orders
12. Completion times

Effluent Limitations

The degree of treatment which must be provided by a particular treatment plant is dictated by the effluent limitations. Public Law 92-500 established the National Pollution Discharge Elimination System (NPDES) which sets effluent limitations. The effluent limitations include biochemical oxygen demand (BOD_5), total suspended solids, and any other effluents limitations that may be discharged into a stream. The effluent limitations vary according to the nature of the receiving stream. The effluent limitations are of considerable importance because they determine the type of treatment works needed and the operational efficiency required.

Alternatives

A facility plan must investigate and evaluate alternative solutions to the water pollution problem. The following questions must be resolved:

1. Can the existing plant be improved by better operation, maintenance, laboratory control, or management to the point where construction may be minimized or eliminated?
2. If number 1 is not practical:
    a. Should the existing plant be modified?
    b. Should a new plant be built?
    c. If so, where should it be built?
    d. What type of process should be used?

3. Which of the following waste treatment management techniques seems most appropriate?
    a. Biological treatment and discharge into the receiving stream
    b. Physical-chemical treatment and discharge into the receiving stream
    c. Treatment and reuse
    d. Land application
    e. No action
4. Factors to be considered in choosing treatment management techniques include:
    a. Engineering feasibility
    b. Environmental impact

c. Cost

d. Ability of applicant to implement the technique

Infiltration/Inflow Analysis

The facility plan must contain an infiltration/inflow (I/I) study. (Infiltration is ground water which leaks into the sewers; inflow is storm water which enters the sewers.) During start-up the engineer should check the I/I study to determine if excessive I/I was eliminated.

An infiltration/inflow (I/I) analysis should indicate the:

1. Cost of transporting I/I
2. Cost of treating I/I
3. Cost of removing all or part of I/I
4. Amount of I/I to be removed and amount to be left
5. Need for a sewer system evaluation survey

Sewer System Evaluation Survey

This survey is conducted only if the I/I analysis indicates that excess I/I exists. The evaluation survey consists of some or all of the following:

1. A physical survey of the system
2. Smoke bomb or air pressure testing
3. Selected sewer system cleaning
4. Visual (TV or photographic) inspection of selected sewer sections
5. Preparation of a report

The evaluation survey will identify specific sections of the sewer system which must be repaired by:

1. Grouting
2. Sealing

3. Lining
4. Replacing

Public Input

The public should participate from the beginning in facility planning. This allows interests and potential conflicts to be identified early and considered as the planning proceeds. Public hearings should:

1. Define issues
2. Analyze information
3. Explain costs
4. Discuss alternatives
5. Allow all interests to be heard
6. Emphasize O&M costs

The reviewer should review transcripts of the hearings to determine the extent to which O&M costs were discussed.

Cost Effective Analysis

Each alternative should be analyzed and evaluated in regard to its relationship or impact upon monetary cost based upon:

1. Present worth or equivalent annual cost over planning period
2. Interest rate
3. Capital and O&M costs
4. Existing facilities--considered as sunk cost
5. Service life*

* It must be noted that this cost effective analysis is significantly affected when comparing package facilities with cost-in-place facilities. This is because package facilities typically have life expectancies less than cost-in-place facilities.

Selected Alternative

After all investigations and alternatives are evaluated as part of a facility plan, one alternative is selected and described in greater detail. The selected plan describes the project for which Step 2 and Step 3 construction grants may be requested by the applicant.

Review, Certification, and Approval of Plans

The three levels of review of a facility plan are:

1. Review by clearinghouse (A-95)
2. Review by state
3. Review by EPA

EPA will review for approval only those facility plans which have received clearinghouse and state approval. (These reviews may be simultaneous.) The EPA Regional Administrator has the authority to approve any facility plans submitted by a state within his/her region. The applicant is then ready to complete the application for a Step 2 grant.

PHASES WHERE O&M MUST BE STRESSED

The state/EPA reviewer must remember that all of the information in the handbook (as well as other construction grants publications) are applicable to:

1. Wastewater treatment facilities
2. Pumping stations
3. Interceptor sewers
4. Force-main sewers
5. Collector sewers
6. All other grant fundable items

Preapplication Conference

A preapplication conference should be held with all applicants. Representatives of the state, EPA, and the applicant should be included in these meetings. This conference is not required; however, it is strongly recommended.

The goal of this conference is to produce a well-coordinated program that avoids pitfalls and delays. The entire O&M construction grants process should be addressed with emphasis placed on Step 1 program requirements. Topics to be covered include such areas as administrative and technical requirements. Additional meetings should be conducted prior to Step 2 and Step 3.

Public Law 84-660, section (8)(b), PL 92-500, section 204(a), and the Code of Federal Regulations, 40 CFR 35.935-12 (Operation and Maintenance), clearly state the requirements for proper operation and maintenance of federally funded facilities. Improper operation and maintenance can void federal expenditures for pollution abatement. This must be explained to the applicant. A review and discussion of the applicant's past record on previously funded projects should be covered. Approval of Step 1 awards should be tied in with proper operation and maintenance of existing facilities. The O&M requirements of 40 CFR 35.925-10, Operation and Maintenance Program, 40 CFR 35.935-1 (b), Grantee Responsibilities, and 40 CFR 35.935-12, Operation and Maintenance, should be covered. In 40 CFR 35.925-10 the applicant has to show that provisions have been made to assure proper operation and maintenance of the treatment works and sewer system and to comply with 40 CFR 35.935-12. Under 40 CFR 35.935-1 the grantee agrees to complete the treatment works according to approved plans and specifications and to maintain and operate the treatment works for its design life. Failure to do so may cause recovery of federal funds (according to 40 CFR 35.965, Enforcement). The Code of Federal Regulations, 40 CFR 35.935-12, is one of the most important regulations concerning O&M considerations in the grants program. The CFR lists documents that are required and describes the grantee's and state's responsibilities in regard to operation and maintenance. Also included in the CFR is a payment schedule requirement.

To help ensure that on operable facility is planned, designed, and constructed, the reviewer, during the preapplication conference, should explain the responsibilities and liabilities of the grantee, consultant, and contractor as outlined under the following statutes:

a. 40 CFR 35.935-5 Grantee's Responsibilities
b. 40 CFR 35.937 Subagreements for Architectural or Engineering Services
c. 40 CFR 35.938 Construction Contracts (Subagreements) of Grantees

d. Appendix C-1 of 40 CFR Required Provisions Consulting Engineering Agreements

e. Appendix C-2 of 40 CFR Required Provisions Construction Contracts

If all decisionmakers implement their responsibilities as outlined in the CFR's and the appendices, then the operational considerations (flexibility, operability, maintainability, durability, cost-effectiveness) will be included in the planning, design, construction, and operation of the facility.

A documentation of the influent flow and load characteristics is needed. The applicant needs to show what data was used to determine flow and load. The reviewer needs to determine if this data is realistic.

If the applicant has an existing plant, a cost analysis evaluation of optimum operation and maintenance of the facility should be included in the facility plans. If upgrading of operation and maintenance is cost-effective, then new or supplemental construction is not necessary.

The applicant should be informed that a plan of operation is required (40 CFR 35.935-12). A preliminary plan must be submitted with plans and specifications in the Step 2 application [40 CFR 35.920-3 (c)(3), Contents of Application]. The final plan of operation must be submitted and approved by the time 50 percent of the Step 3 grant payment is made. The applicant must know and understand what a plan of operation is. Program Requirements Memorandum (PRM) 77-3 should be used to explain the plan of operation. From this PRM, the applicant will gain an understanding of a plan of operation and its funding eligibility under the grants program.

The Code of Federal Regulations (40 CFR 35.935-12, Operation and Maintenance) requires the preparation of an operation and maintenance manual. This is a requirement of the Step 3 grant process. The engineer should be encouraged to begin development of this manual when drawing the plans and specifications. Sometimes the engineer who starts a project is not the one who finishes it. The practice of first preparing a rough draft O&M manual will aid new personnel in producing a usable O&M manual. It must be stressed to the applicant that a preliminary draft of the manual is required by the time 50 percent of the Step 3 grant payment is made; the final manual is required by the time 90 percent of the Step 3 grant payment is made.

Program Requirements Memorandum 77-2 (Grant Eligibility of Start-up Services) should be explained during the preapplication conference. This PRM identifies certain services performed during the start-up period of a treatment works that are eligible for grant funding. These services should ensure that the operational objectives of the treatment works will be achieved quickly and effectively. Emphasis should be placed on early planning for start-up services. Early planning will make the applicant aware of operation and maintenance concerns throughout the entire grant process.

The applicant must be informed of the obligations which follow construction. The plant must be operated and maintained to meet its NPDES permit. The funding for operation and maintenance of the treatment works is the grantee's responsibility. The grantee must consider:

1. The energy cost of plant operation
2. Replacement costs
3. Maintenance costs
4. Wages and salaries based upon:
    a. Local wage scales
    b. Pay scales for similiar wastewater treatment plants
    c. Civil service
    d. Unions

e. Local economy

f. Training

g. Skills

h. Experience

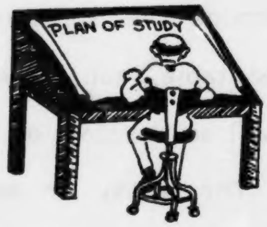
i. Need for personnel not available in local area

This money will come from the user charge system and the industrial cost recovery system. These should generate enough revenue to effectively and efficiently operate the wastewater treatment facility.

The reviewer should become familiar with and use the checklist titled "Preapplication Conference, O&M Considerations For Discussion." Use of this checklist will help to ensure that the O&M requirements of the construction grants process are explained to the applicant.

Plan of Study

The plan of study is the first element in a request for grant assistance. It is not a facility plan nor is it part of a facility plan.



The plan of study: (1) lists the required tasks to be accomplished in preparing the facility plan, (2) assures that the applicant will complete the facility plan in accordance with all applicable laws and regulations, and (3) lays the groundwork for the facility plan.

The reviewer should utilize the Plan of Study Review Operation Checklist when reviewing the plan of study. It can be a useful reviewing tool which helps the reviewer ensure that O&M concerns are considered in the plan of study.

The plan of study should be reviewed very carefully. It must meet all the statutory requirements of 40 CFR 35.920-3 (a), Contents of Application. It must contain the following information:

1. A description of the proposed planning area (including maps)
2. An identification of the entity or entities that will conduct the planning
3. A statement of the nature and scope of the proposed Step 1 project and public participation program, including a schedule for the completion of specific tasks
4. An itemized description of estimated costs for planning of the project
5. Any significant public comments

The planning area (number 1 above) must be examined closely. This section of the plan of study should provide a brief description of the planning area, its size, population, governmental entities, and type. This information will have an effect on O&M considerations. The planning area will determine the size and type of treatment and sludge disposal. Also, the water table, soil, lakes, and rivers will affect the type of treatment needed as well as the O&M of the facility.

The entity or entities that will conduct the planning also affect O&M requirements. The reviewer should review O&M performance at existing facilities. Past performance often indicates future performance. Other O&M concerns include the financial responsibility of the entity(ies) and its ability to attract trained personnel.

Since the facility plan is dependent upon the plan of study, attention must be focused on those items necessary for its development. The reviewing agency should pay close attention to the nature and scope of the proposed

Step 1 project. A schedule for the completion of specified tasks and an itemized cost estimate of the project should be included in the plan of study. In addition, it must demonstrate that all statutory requirements of the entire construction grants process are understood by the applicant and that these requirements will be complied with. From the information provided, the reviewing personnel need to ensure that all operation and maintenance program requirements for a facilities plan and Step 1 grant application are included. Each task listed should be evaluated in terms of O&M program requirements. Each task in the plan of study should indicate that the applicant knows and understands the importance of operation and maintenance, whether it is a program requirement or not. The reviewing agency should ensure the applicant's consideration of:

1. Proper and efficient O&M of the existing plant
2. O&M costs and their inclusion in the development and evaluation of alternatives
3. Public notification of O&M costs
4. O&M costs as reflected in preliminary design cost estimates
5. The development of a preliminary O&M manual
6. O&M funding with user charge system and industrial cost recovery
7. The development of start-up services
8. The development of a plan of operation

NOTE: The applicant would also be required to show that Sec. 204(a)(4) of PL 92-500 as amended will be complied with. (This section requires that the grantee will properly operate and maintain the federally funded wastewater treatment facility.)

The reviewing agency should review the transcript of all public hearings for any public comments that may affect O&M or its funding. If the public is against the proposed project for any reason, proper and efficient operation and maintenance of the wastewater treatment works is jeopardized.

The plan of study will also contain data on infiltration and inflow. If I/I is not a problem, the applicant must provide written certification by the state that excessive infiltration and inflow does not exist. If it is a problem, then the applicant must indicate that detailed sewer evaluation is needed.

After reviewing the plan of study, the agency may approve or disapprove it. If approved, and a grant offer is made and accepted, the applicant may begin to develop the facility plan.

Facility Plan

The facility plan is begun after the plan of study has been approved and a grant offer has been made and accepted. However, state review program responsibility does not end with a grant offer. As the plan develops, it should be reviewed on an ongoing basis. This will assure that all requirements are being met and will allow needed changes to be made.

The complexity and scope of the project dictates the details of the facility plan. The reviewer is allowed to exercise flexibility in advising grantees on facility plan requirements [40 CFR 35.917-4 (b), Planning Scope and Detail].

The regulatory requirements for a facility plan have been set (40 CFR 35.917-1, Contents of a Facility Plan). Briefly, the plan must contain:

1. A description of the treatment works including preliminary engineering data, cost estimates, and completion schedules for design and construction
2. A description of the complete waste treatment system
3. Documentation of infiltration and inflow

4. An analysis of cost-effectiveness including:
   a. A statement relating capacity to needs and land reserve
   b. Measures for flow and waste reduction
   c. A description of optimum performance of the existing facility
   d. A statement of ability to meet effluent limitations
   e. A description of application of the best, most practicable waste treatment technology
   f. Method of disposal of effluent and sludge
   g. Impact on the environment
5. A statement of effluent limitations or NPDES permit
6. Clearinghouse comments
7. A summary of the public hearing
8. A financial statement which verifies that the grantee has the resources to construct, operate, and maintain the treatment works
9. Proof of compliance with the Civil Rights Act of 1964

In conducting the review, the reviewer should use the Facility Plan Review Operation Checklist. This checklist was developed as an aid to the reviewer. Its proper use will help ensure the consideration of O&M concerns in the construction grants process during the development of the facility plan.

These requirements overlap each other in many instances and may not be understood by the applicants or their consultant. With this in mind, EPA published Construction Grants Program Requirements: Guidance for Preparing a Facility Plan, Revised May 1975, (MCD-46), (EPA-430/9-76-015), which includes a suggested format. The intent of this publication was to simplify the procedure for the applicant. The review procedures and included checklist discussed in this handbook will be based upon the suggested format.

The reviewer must pay close attention to the effluent limitations stated in the facility plan. These limitations determine the type of treatment needed. These limitations are an indication of the type of plant operation and maintenance required to achieve the allowed effluent. The establishment of the effluent limitations is a state responsibility. The reviewer needs to ensure that proper data is used by comparing the applicant's data with limitations set by the state.

When reviewing the current situation, the reviewer must determine that an inventory of wastewater flows and the treatment system has been submitted.

The inventory should include:

1. Location of all treatment facilities
2. Location of all sewer systems
3. A description of all facilities (including design capacity and existing flow and load)
4. A list of industrial users
5. An analysis of peak, low, dry, and wet weather flows
6. A diagram of bypasses and overflows
7. A program to reduce inflow/infiltration
8. A program of user conservation

The purpose of this inventory (along with the population projection) is to furnish data from which future flows will be determined. It may also indicate the severity of the pollution problem.

Another problem that will affect the O&M of a treatment works is infiltration and inflow. A sewer system evaluation is part of a facility plan. This evaluation consists of an infiltration and inflow that can be economically eliminated. This reduction in I/I may eliminate the need for any additional treatment works by altering conditions at the existing treatment facility.

Performance of the existing treatment facility needs to be evaluated by the applicant. The major components of the existing system are evaluated for possible use in the new project. This section will explain the problems that are affecting plant performance and will present methods for correcting these problems. If it is economical and environmentally sound, the existing system should be utilized. In the evaluation review, the reviewer must consider:

1. Adequacy of treatment plant design for type and amount of flow
2. Adequacy of operation and maintenance
3. Effects of I/I
4. Effects of industrial users

This evaluation must be carefully weighed before it is accepted or rejected by the reviewer.

The applicant must develop a forecast of future flows and loads. This forecast is based upon future land use plans or development patterns, and economic and population projections. The reviewer needs to ensure that reliable data and methodologies were used in projecting future flows and loads.

FLOWS
LOADS

This projection, along with the existing flow and load, will determine what degree of treatment is needed to achieve the effluent limitation. The more complex the treatment, the more complex the O&M procedures.

From the above data, the applicants or their consultants will evaluate possible alternative solutions to correct the pollution problem. The first alternative is use of the existing facility. As noted earlier, many treatment works are not being operated or maintained properly. Optimum operation of the existing facility must be considered. In responding to this, the reviewer will determine whether or not the applicants or their consultants gave adequate consideration to this alternative. An intensive review by the reviewer may be required. The reviewer must keep in mind that the consultant may be looking for a job or the applicant may have little or no knowledge of the wastewater treatment system and its function.

The reviewer should obtain data on design, actual flow, plant and/or unit efficiency, treatment deficiency, age, useful life of plant, type of O&M program, existing O&M inspection reports, pretreatment requirements, I/I reduction, modifications needed, and costs. Improved O&M of the existing plant may reduce or eliminate the need for new facilities.

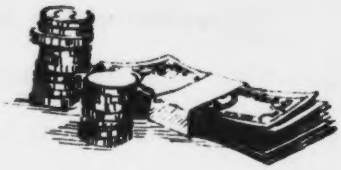
The applicant must also investigate other wastewater treatment facility alternatives. In so doing, the applicant must consider the following options:

1. No action
2. Flow and waste reduction
3. Use of existing sewers and interceptors
4. Sludge disposal
5. Best practicable waste treatment technology (BPWTT)
6. Use of industrial services

Investigation of the above will help the applicant eliminate many alternatives. This number can be reduced by further using sound engineering, environmental, and ecomonic principles. After selecting the most feasible alternatives, an evaluation of each (money, environment, implementation) is completed in order to select the most cost-effective and environmentally sound project.

A monetary cost analysis must be conducted during the evaluation of the most feasible alternatives. It should include capital and operation and maintenance costs.

NOTE: Monetary cost should be shown in total in terms of its full impact on the average citizen and industry being served monthly and annually. Included should be the capital cost of the grantee (local share), interest on borrowed capital, sinking fund costs, O&M cost, connection charges, etc.



Close attention must be paid to O&M costs and anticipated revenues. These costs must be realistic to the type of process and treatment work size. A user charge system must be developed from the projected O&M costs. This user charge must provide enough revenue for the proper and efficient operation and maintenance of the wastewater treatment facility.

Other important O&M considerations in the evaluation of alternatives are flexibility and reliability. The applicant needs to consider: (1) future plant expansion and land requirements, (2) easements and rights-of-way for the sewer, (3) the treatment process, and (4) equipment and personnel. The applicant's consideration of these must be ensured by the reviewing agency.

After careful evaluation of all feasible alternatives, the applicant holds a public hearing. Using input from this hearing, the most cost-effective and environmentally sound alternative is selected.

The preliminary design of the selected treatment works should be reviewed carefully. The type of process needs to be reviewed and the complexity and cost of operation and maintenance determined. Many cities are not properly operating or maintaining their existing wastewater treatment facilities because it would bankrupt them. Others are unable to obtain needed personnel to operate a complex treatment process. The treatment works design and process should be based in part on the entity's or entities' ability to fund operation and maintenance and to attract qualified personnel.

In reviewing the selected plan, the reviewer needs to ask the following question: "If the facility is properly designed, operated, and maintained, can it achieve permit effluent limitations?" In addressing this question, the reviewer must make sure that plans are included which meet O&M staffing and training requirements. Unit processes must be operable, flexible, and maintainable under projected load flow conditions. The discharge permit requirements should also be included in the facility plan. The requirements and influent characteristics will determine the type of monitoring and process control testing needed. The more complex the control testing requirements, the more complex is the operation and maintenance of a treatment works.

The hydraulic arrangement has great impact on O&M. This must be considered during the planning process. Poor hydraulic arrangement can result in plant shutdown when only one unit needs repair. Arrangement should allow for even distribution of influent among parallel units.

The impact of industrial waste should also be considered. The treatment process is a biological one. Any toxic or unusual waste will disrupt the process and result in poor plant performance. Pretreatment of industrial waste may be necessary to prevent process failures.

Many designers overlook plant return side streams. These side streams must be considered when designing a treatment facility. Return of supernatant liquor, thickener overflow, and sludge will greatly affect BOD's, total suspended solids, and nutrients. If these are not considered, the NPDES permit limitation may not be met.

Pretreatment should be considered; in many instances, it will reduce the operation and maintenance problems at a treatment plant. This must be documented.

The plant design must be flexible enough to allow for different modes of operation (e.g., an activated sludge plant may be operated as an extended air or contact stabilization plant). This flexibility will assure continuous operation and maintenance of the plant during flow and load changes, plant expansion, and/or unit repair.

The influent characteristics should also be documented. The applicant must provide sampling and analytical data used in the planning process. This data determines the degree of treatment needed to obtain effluent limitation. Therefore, the reliability of this data is important.

PUBLIC
HEARING

The reviewing agencies should require documented proof that O&M costs were discussed during the public participation phase of the plan of study. To attract people's attention, a large printed notice should be published. These notices should state the cost of operating and maintaining the plant after construction and the name of the funding institution or agency. It should be made clear that, in applying for and accepting a construction grant, the public accepts the responsibility to fund the operation and maintenance of the wastewater treatment plant.

Many implementation agreements require careful consideration. Some of these are administrative in nature and have no bearing on O&M. However, there are several that have a direct or indirect effect on the operation and maintenance ability of the applicant.

The funding of nonfederal costs should be reviewed. The financial arrangements for funding nonfederal costs may severely limit the applicant's funding ability for operation and maintenance.

User charges and debt-service charges should be considered in the facility plan. Some questions that should be asked are:

1. What was the basis of these charges?
2. Are they realistic?
3. Were they used only to satisfy the public during the public participation phase?
4. Will these charges fund proper and efficient operation and maintenance?

These two charges need to be investigated completely. Funding for proper operations and maintenance is dependent upon them.

Last, but not least, is the applicant's past record of operation and maintenance of existing federally funded facilities (40 CFR 35.935-1, Grantee Responsibilities). If the grantee is not providing adequate O&M at existing plants, then appropriate action must be taken.

The reviewing agency must prepare a summary of comments and recommendations for the applicant. These should be implemented by the applicant prior to approval of the facility plan or before a Step 2 grant application is accepted.

PROBLEMS THAT MAY DEVELOP IF O&M IS NOT CONSIDERED IN STEP 1

Operation and maintenance considerations may be overlooked when planning a wastewater treatment facility. The lack of concern has created many operation and maintenance problems for the operator. Major problems that have developed are:

1. Inadequate funding for O&M
2. Inadequate training for operators
3. Inadequate laboratory facilities
4. Nonexistent maintenance management programs
5. Useless O&M manuals
6. Inflexibility in the systems
7. Staffing difficulties

The lack of adequate funding for O&M is a major problem. Utility owners (city officials and the public) must provide the money needed to get the job done. The applicant must be aware of the program requirements for O&M funding (40 CFR 35.935-1, Grantee Responsibilities). To meet these requirements the applicant must make provisions for sufficient O&M funding. A user charge system must be developed. If these O&M requirements are ignored, then adequate funding of O&M is jeopardized.

Along with O&M funding, the training of operators is a problem. The grantee should provide qualified trained personnel and pay adequate salaries. This is impossible without knowledge of O&M requirements such as funding for pre- and poststart-up training as defined in PRM 77-2 and training as part of the plan of operation (PRM 77-3). Additional training should be required to strengthen the operator's skills. Without training, or with insufficient training, there is little chance for proper and efficient O&M to be achieved.

Another problem is the lack of laboratory facilities. Laboratory testing procedures are necessary to determine the efficiency of plant operation, and to ensure compliance with the NPDES permit. Without these procedures, poor operation practices may result. In addition, there is no way to monitor NPDES permit compliance.

Operation and maintenance also suffers when an effective maintenance management program is not developed. If the operator does not know what preventive maintenance is needed, or when it is needed, it cannot be performed properly. This program is part of the O&M manual requirements. Early knowledge (prior to Step 1 application) of the need for an O&M manual will provide an opportunity to establish an efficient maintenance management program.

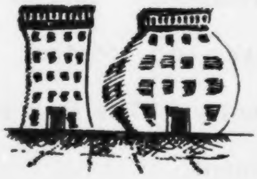
A system needs to be flexible. The operator must be able to make changes in the operation of the treatment plant. If these changes cannot be made, then O&M of the plant is impaired. This is an O&M requirement that should not be omitted.

Staffing is another problem the applicant will face. For example, the Imhoff tank with an oxidation pond may require a minimally skilled, part-time operator, while the new wastewater treatment facility (an extended aeration plant) would require several full-time, highly skilled operators. The applicant must be able to attract these operators in order to staff the treatment works properly. This is not always an easy task and often means higher salaries for more people.

The grantee faces problems, not only after the system is on line, but throughout the entire grant process. From the beginning of the grant process, O&M concerns must be emphasized. If the applicant develops a plan of study deficient in O&M concerns, the result will be delays in approval and increased costs which the applicant has to fund. Not only would the plan of study be faulty, but the applicant would not be aware of its responsibility for O&M. Without knowledge of O&M requirements (user charges, funding of O&M, etc.) the applicant may develop an erroneous cost/benefit analysis which will result in improper plan selection. The applicant may select a plan that will cause bankruptcy if the treatment plant is operated properly. The plan selected may also call for trained operators that are not available to the applicant. The problems alone would prevent the applicant from operating and maintaining the treatment plant properly.

Plant size is often another problem. Influent characteristics (flows and loads) used for planning and design must be documented. Undocumented characteristics will result in a plant that is either oversized or undersized. An undersized plant (hydraulically and/or organically) cannot be operated to obtain the desired effluent. It will have to be modified to handle the influent characteristics. Until these expensive modifications are made, the plant will continue to produce a poor quality effluent.

An oversized plant will also create O&M problems. The user charge to fund O&M may be unrealistic. If everything at the plant is oversized (labs, pumps, etc.) O&M costs will be excessive and the plant will not be able to produce the desired effluent due to underloading. Plans that have not given proper consideration to flexibility may produce a poor quality effluent.



Another important O&M requirement is the plan of operation. The applicant must be able to develop a reliable plan of operation which includes a statement of what must be done and when it must be done. This assures proper and efficient start-up and continued operation. Early knowledge of PRM 77-3 (Plan of Operation For Municipal Wastewater Treatment Facilities) will enable the applicant to develop a usable plan of operation at the beginning of the grant process.

Early knowledge of the O&M manual requirement is a must. The applicant's design engineer should begin the project with the O&M manual in mind. As the project progresses, a better design may be the result. A better designed plant may eliminate many O&M problems. If the O&M manual requirement is not discussed early, a poorly designed plant with an unusable manual could be the result.

Improper start-up of the treatment works presents another potential problem. This causes delays and problems in achieving operational objectives which may take weeks, months, or years to correct. Some problems associated with start-up are lack of trained personnel, development of unsafe O&M procedures, inferior operation procedures, and improper operation of equipment. The applicant must be informed early of PRM 77-2 so start-up services can be planned from the beginning of the construction grants process. From the facility plan comes the design phase and its plans and specifications. Without O&M concerns, the design phase may result in a process and control system that cannot be used to operate the plant efficiently. The lack of O&M concerns will also result in the use of unreliable equipment.

If O&M is ignored, or introduced late in the construction grants program, many problems will develop. Every effort should be made from the beginning to expose the applicant to O&M program concerns in the construction grants program. This will not eliminate all problems but it will reduce the number and magnitude of problems.

PREAPPLICATION CONFERENCE

O&M CONSIDERATIONS FOR DISCUSSION

1. O&M requirements are described in 40 CFR 35.925-10 (Operation and Maintenance Program), 40 CFR 35.935-1 (Grantee Responsibilities), and 40 CFR 35.935-12 (Operation and Maintenance).
2. Facility plans must include cost-effectiveness analyses that contain evaluations of improved effluent quality attainable through optimum operation and maintenance of existing facilities as an alternative or supplement to construction of new facilities [40 CFR 35.917-1(b)].
3. Proper operation and maintenance of federally funded facilities is a longstanding requirement [PL 84-660, Section 8(b); PL 92-500, Section 204(a)(4); 40 CFR 35.935-12]. Inadequate operation and maintenance can cancel federal expenditures on facilities designed to abate municipal pollution. Grantee may be ruled nonresponsible with respect to applications of grants unless existing federally funded facilities are adequately operated and maintained [40 CFR 35.935-1]. (Note: EPA/state personnel should review grantee files to verify adequacy of existing facility O&M.) Step 1 grants can be awarded conditionally based on improved O&M. The scope of work for plans of study could include early evaluation of existing facility O&M and recommendation of necessary improvements. Upon completion of these improvements, Step 1 grants could then be awarded.
4. Grantee needs to document influent characteristics (flow and load) for planning and design purposes.
5. Plans of operation must be prepared (40 CFR 35.935-12) and are grant eligible (PRM 77-3).

    a. Preliminary plan must be submitted with plans and specifications [40 CFR 35.920-3(c)(3), Contents of Application].
    b. Final plan must be submitted and approved before 50 percent of the Step 3 grant payment is made (PRM 77-3).

6. O&M manual must be prepared (40 CFR 35.935-12).

   Note: Writing should start when the design engineer begins.

    a. Draft manual must be submitted by the time 50 percent of the Step 3 grant payment is made.
    b. Final manual must be submitted by the time 90 percent of the Step 3 grant payment is made.

7. Planning for start-up services should begin early. Start-up services are grant eligible (PRM 77-2).
8. User charge system must be developed.
9. Funding of O&M budget must be considered.

PLAN OF STUDY

REVIEW OPERATION CHECKLIST

40 CFR 35.920-3(a)

CONTENTS OF APPLICATION

	YES	NO	NA
1. Proposed planning area is included within jurisdiction.			
2. Entity or entities are identified to conduct the planning.			
3. Summary of the existing system is included.			
4. Nature of the problem is stated.			
5. Facility planning requirements are included.			
6. Task statement, schedule, and cost are included.			
7. Maps of planning areas are included.			
8. Applicant displays both knowledge and understanding of all applicable rules and regulations for preparing the facility plan (including all O&M requirements).			
9. Applicant shows an understanding of PL 92-500, Sec. 204(a)(4), as amended.			
10. The plan of study addresses the operation and maintenance program requirements for a facility plan.			
11. Itemized costs are realistic.			
12. Timetables are realistic.			
13. Identified tasks will lead to a facility plan that addresses O&M program concerns and complies with all rules and regulations.			

Signed________________________________

Date__________________________________

FACILITY PLAN

REVIEW OPERATION CHECKLIST

		YES	NO	NA
1.	Have existing facilities, as an alternative or supplement to construction of new facilities, been evaluated based on improved effluent quality attainable through optimum operation and maintenance (40 CFR 35.917-1, Contents of Facilities Plan)?	___	___	___
	NOTE: In responding to this question, the reviewer should determine whether the following factors have been considered:			
a.	Design vs. actual loading.	___	___	___
b.	Treatment efficiency for each unit process.	___	___	___
c.	Treatment deficiency cause(s).	___	___	___
d.	Maximum overall treatment efficiency obtainable with existing unit processes.	___	___	___
e.	Age, reliability, and probable useful life of existing equipment.	___	___	___
f.	Capabilities of existing staff and the need for additional O&M personnel and upgrade training.	___	___	___
g.	Pretreatment ordinance (40 CFR 35.907, Municipal Pretreatment Program, 40 CFR Part 403, Pretreatment Standards).	___	___	___
h.	I/I reductions.	___	___	___
i.	Unit process modification(s).	___	___	___
j.	Minor modifications (capital).	___	___	___

	YES	NO	NA
2. If properly operated and maintained, will the proposed facility meet requirements for effluent limits?	___	___	___

NOTE: In responding to this question, the reviewer should determine whether the following factors have been considered:

	YES	NO	NA
a. Plan provides for a sound and attainable O&M program.	___	___	___
b. Plans are included for staff development and training.	___	___	___
c. Requirements for staffing and training will provide satisfactory O&M.	___	___	___
d. Staff from the existing facility is adequate for operation of the proposed facility.	___	___	___
e. Operability and flexibility of unit process(es) have been evaluated.	___	___	___
f. Discharge permit requirements and influent, effluent, and process control testing requirements have been determined.	___	___	___
g. Impacts of hydraulic, organic, industrial, and inplant return side stream variations have been evaluated.	___	___	___
h. Pretreatment program requirements have been determined.	___	___	___
3. Is the plant design flexible enough to:			
a. Allow for different modes of operation?	___	___	___
b. Accomodate future expansion and change?	___	___	___
c. Assure adequate operability and maintenance?	___	___	___
4. Has grantee documented (through sampling and analytical data) the influent characteristics used in the planning process?	___	___	___

YES NO NA

5. Have O&M costs and revenues been adequately evaluated [40 CFR 35.917-1(d)]? ___ ___ ___

   a. What are the total O&M costs? $__________

      1. Power costs $__________

      2. Chemical costs $__________

      3. Parts and replacement costs $__________

   b. What are the annual O&M costs to each user class?

      1. Residential $__________

      2. Industrial $__________

      3. Other $__________

   c. What are the available annual O&M revenues?

      $__________

6. How has the grantee informed the public of the estimated O&M costs?

   ____

   a. Total annual costs = $__________

   b. Cost per household = $__________

7. Has grantee adequately operated and maintained existing federally funded facilities [40 CFR 35.935-1]? ___ ___ ___

   NOTE: If grantee is not providing adequate O&M at existing federally funded facilities, responsive EPA operations include:

   a. Determining grantee ineligible for Step 2 grant.

   b. Basing award of Step 2 grant on the condition of improved O&M.

   c. Taking enforcement action as appropriate.

   d. Providing or requiring onsite technical/training assistance in conjunction with an enforcement action.

e. Taking no specific action if O&M problems are determined to be minor and/or not the result of grantee actions/inactions.

8. Summary comments and recommendations:

a. O&M of existing facilities______________________________

____

b. Considerations of O&M requirements in proposed project

____

c. Recommendation on facility plan approval____________________

____

Signed____________________

Date____________________

O&M CONSIDERATIONS

STEP 2

CONSTRUCTION GRANTS PROCESS

UNIT 3

UNIT THREE

OBJECTIVES

Following the Unit Three presentation the participant will be able to:

1. Recognize and discuss the phases in Step 2 of the Construction Grants Process.
2. Determine and explain the O&M considerations that must be included in the Step 2 application.
3. Identify and explain the O&M program requirements that must be discussed at a predesign conference.
4. Evaluate operation and maintenance needs of the design of a wastewater treatment facility.
5. Utilize various review techniques in the review of plans and specifications.
6. Determine that all O&M program requirements have been included in the plans and specifications.
7. Utilize, in conducting a review, the information contained in EPA MCD-05, Design Criteria for Mechanical, Electrical, and Fluid System and Component Reliability.
8. Evaluate the plan of operation for O&M program requirement compliance.
9. Discuss problems that may develop if O&M is not considered in Step 2.
10. Identify and use the Operational Review Checklist in the Step 2 Application Review Predesign Conference, Plans and Specifications Review, and Plan of Operation Review.

UNIT THREE

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OVERVIEW OF THE STEP 2 PROCESS

Step 2 Grant Application

The application package is reviewed and must be approved by the state and/or the EPA. The grantee is not to proceed with any work on the project until instructions to do so are received from EPA or the state.

An approved facility plan, as described under Step 1, is required as part of the Step 2 application. If the facility plan has already been approved by EPA or the state, only a copy of the approval letter must be submitted.

The application form is submitted by the authorized representative of the territory included in the facility plan. In all cases, the applicant must have the authority to design, finance, construct, operate, and maintain any resulting wastewater treatment facilities.

Contracts and subagreements for services are submitted by the applicant and reviewed by both the state and/or EPA. At this point in the grant process these are generally consulting engineering services. Contracts and subagreements are reviewed to determine that:

1. The scope of work is sufficient to prepare approvable plans and specifications
2. Complete schedules are reasonable and in agreement with the facility plan

Grantees are required to develop a user charge system which is applicable to all users. This sytem covers operation and maintenance costs of the treatment works. At the time of application for a Step 2 grant, applicants must submit a statement of resolution and a schedule for completing the user charge system.

(EPA may not pay more that 50 percent of the Step 3 grant until evidence of the development of the user charge is received. Also, no more than 80 percent of the Step 3 grant may be paid until the user charge is approved by EPA. The user charge must be ready for implementation by the time the project is completed.)

EPA APPROVED

The grantee must develop an industrial cost recovery system. This is a system which recovers from industrial users that portion of the federal grant which is equal to the industry's share of capital cost of the project. The grantee must assure EPA that all industrial users will be charged their fair share.

A copy of existing sewer use ordinances, or a letter of intent stating that such ordinances will be enacted, must be included in a Step 2 application. The ordinance must require that new connections be properly designed and constructed and free from storm water flow. If the grantee does not have an existing sewer use ordinance, the Water Pollution Control Federation offers an excellent example. The reviewer should refer the grantee to WPCF Manual of Practice #3.

Projects which entail the acquisition of private property or the displacement of persons are subject to the provisions of the Uniform Relocation and Land Acquisition Policies Act of 1970. A Step 2 Grant Application must include a statement assuring that the applicant will comply with the provisions of this Act.

Predesign Conference

The applicant, engineer, state personnel, EPA, and the O&M specialist should meet in a predesign conference.

All parties at the predesign conference should be keenly aware of the necessity of considering O&M in the design of the plant. The knowledge of an experienced operator should be relied upon heavily at this point.

Plans, Specifications, and Estimates

The end product of the Step 2 detailed design is a set of plans, specifications, and detailed construction cost estimates which are suitable for bidding and construction purposes.

Preliminary Plan of Operation

A plan of operation is required for all plants. The plan should include a list of actions needed to ready the plant and its personnel for operation when construction is complete.

Applicability of Step 2 Grant Requirements

All Step 2 requirements discussed apply not only to wastewater treatment facilities, but are also applicable to all grant funded items such as:

1. Pumping stations
2. Interceptor sewers
3. Force-main sewers
4. Collector sewers

Reviewer/Grantee Relationship

The reviewer should try to remain in constant contact with the grantee if possible. The reviewer should be able to furnish the grantee with information on the construction grants process, A/E firm selection, etc. As an example, the grantee may find it desirable to change A/E firms or select a contractor. The reviewer may advise the grantee to investigate the following:

1. Specialized experience and technical competence
2. Past record and performance on fullfilling contractual obligations
3. Capacity to perform the work required within time limitations (the firm's current workload must be considered)
4. Familiarity with the types of problems applicable to the project
5. Avoidance of conflict of interests
6. Philosophy on community development (which may conflict with the applicant's philosophy)
7. The engineers' previous proposals
8. Other facility plans developed by the A/E firm
9. Other facilities under construction
10. Cost overruns
11. Change orders
12. Completion times

OPERATIONAL REQUIREMENTS IN STEP 2 GRANTS

Operational Considerations in Step 2

The consideration of O&M does not end with the approval of the facility plan. The need to be aware of and able to implement O&M program concerns extends throughout the entire construction grants program. There are special O&M concerns that must be stressed in Step 2 of the grants process.

After approval of the facility plan the applicant may submit a request for a Step 2 grant. This request is reviewed to determine that:

1. The name, project number, description of grant, and amount of grant request agrees with state priority certification and state priority list
2. The form is signed by the authorized representative and a copy of the authorization resolution is attached
3. A statement relative to availability of site is attached
4. Information regarding project location, entities involved, and cost data corresponds to that in the facility plan
5. The applicant has proposed a method of financing nonfederal share (including O&M costs)
6. All assurances are included in the application

There are several review techniques that must be used in the review of a Step 2 application. These include an administrative review, a technical review, and an operation review. These reviews are of equal importance and can be conducted simultaneously. The primary concern is the operation review.

Using the Application Review Operation Checklist, the reviewer can ensure that the required O&M concerns have been considered in the Step 2 application. A sample checklist has been included in this unit for the participant to use in the review process. (Refer to page 3-45).

The application must include a schedule or other evidence of compliance with the O&M requirements of 40 CFR 35.925-10 and 40 CFR 35.935-12. This schedule should also include provisions for the preparation of a preliminary plan of operation (PRM 77-3). The cost of this preliminary plan should be identified separately from other costs (PRM 77-3).

The application must contain proof that the applicant has legal authority to design, finance, construct, operate, and maintain the waste treatment facility. This assurance is part of EPA Form 5700-25 and must be signed by the applicant. If the applicant does not have this authority then the application will be rejected.

The assurance statement also contains other O&M program requirements. Upon signing this statement, the applicant agrees to comply with all regulations, policies, guidelines, and program requirements. The statement specifically spells out certain O&M program requirements:

1. Sufficient funds must be available to assure effective operation and maintenance of the completed facility.
2. The facility must be operated and maintained as required by federal, state, or local agencies to meet required minimum standards.

The applicant must fulfill any additional requirements specified by the Regional Administrator.

ASSURANCE STATEMENT

This assurance statement is a legally binding document. It must be signed and included in the application. It can be used to prove that the applicant was aware of O&M requirements.

The application must also contain an approvable user charge system which includes an implementation schedule. The reviewer must ensure that this O&M requirement is met.

If the project involves more than one political jurisdiction, then the proposed service agreements must be reviewed. These agreements will affect the funding of operation and maintenance. If these agreements are not included, or do not address each political jurisdiction's responsibilities for enforcement of the user charge and sewer use and rehabilitation ordinances, they should be returned for clarification. These agreements have a direct effect on the operation and maintenance of the wastewater treatment facility; therefore, all responsibilities must be stated clearly.

The reviewer must ensure that the proposed contracts and subagreements will result in approvable plans and specifications. This is more of an administrative review; however, O&M will be affected if the scope and nature of proposed services will not produce reliable plans and specifications.

The reviewer must ensure that the signature on the Step 2 application is the same as the one on the Step 1 application. If not, then a new authorizing resolution by the applicant is needed. In addition, the reviewer will inform the new personnel of O&M program requirements.

Operational Considerations at the Predesign Conference

To ensure that plans and specifications are developed according to sound engineering principles and program requirements, a predesign conference should be held. This conference should be mandatory because of the complexity of these requirements. It will promote planning, coordination, and completion of the design phase. This conference may be held by EPA or the state agency and should be tailored to fit the needs of the applicants.

At this conference, the reviewer should state all program requirements as related to Step 2 applications. A suggested agenda may be found in the

USEPA, *Handbook of Procedures for Construction Grants Program Municipal Wastewater Treatment Works*, MCD-03, February 1976, page V-11 to V-14. Only those requirements for O&M will be discussed.

A checklist titled "Predesign Conference, O&M Considerations for Discussion" has been developed (page 3-46). The reviewer will find it helpful in conducting a predesign conference on O&M concerns. In addition, the reviewer can verify that all O&M concerns have been discussed at the predesign conference.

The reviewer must give careful consideration to the plans and specifications and must emphasize flexibility, operability, and maintainability of each unit as well as of the overall facility. The mode of operation should be readily changed as load and flow change.

The grantee must be made aware of 40 CFR 35.920-3(c)(3) (Contents of Application) and its requirement for a preliminary plan of operation. The reviewer should provide PRM 77-3 and explain it to the applicant. Explanation of this requirement should enable the grantee to understand and implement the required preliminary plan of operation.

PR
77-3
40
CFR
35.920-3

The reviewer needs to explain 40 CFR 35.935-12 to the grantee, including the requirements for an O&M program, O&M manual, and staffing and training. This should develop in the applicant a better understanding of the need to start planning for an O&M program in the design phase.

The required emergency operating plan should be explained, including the effects of emergencies, how vulnerable the system may be, protective measures, and a response program.

The reviewer should place great emphasis on routing flow flexibility. The plan and its unit must have flow routings that can be changed when required in emergencies or for unit maintenance.

The applicant must be notified of the need for process control development, including tests, laboratory equipment, records, and qualified personnel.

In addition, the O&M budget should be discussed. The reviewer must reaffirm this budget requirement and remind the applicant of the responsibility for funding of this budget. At this time, the user charge and industrial recovery cost should be discussed.

The required ordinances will also be covered. A sewer use ordinance and a pretreatment ordinance are required to help ensure proper and efficient operation and maintenance of the treatment facility.

A discussion of line item costs is required. Costs should be determined for the following grant fundable items:

1. The plan of operation
2. Start-up services
3. O&M manual preparation

The reviewer should also discuss the responsibilities and liabilities of the grantee, consultant, contractor, EPA, and state as outlined under the following statutes:

a. 40 CFR 35.935-5 Grantee's Responsibilities

b. 40 CFR 35.937 Subagreements for Architectural or Engineering Services

c. 40 CFR 35.938 Construction Contracts (Subagreements) of Grantees

d. Appendix C-1 of 40 CFR Required Provisions Consulting Engineering Agreements

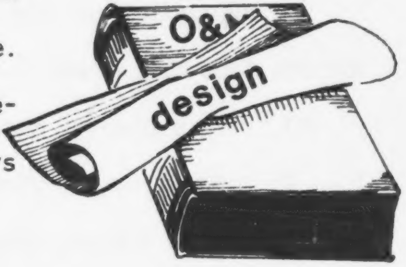
e. Appendix C-2 of 40 CFR Required Provisions Construction Contracts

Documentation of influent characteristics should again be discussed as plant design is based upon influent and effluent limitations.

The predesign conference is a useful tool and an important part of the grant process. It can be used to make the applicant aware of program requirements (especially those related to O&M), and to remind the grantee of its responsibilities for proper and effective operation and maintenance of the wastewater treatment plant. After all, the end product of the Step 2 detailed design is a set of plans, specifications, and detailed construction cost estimates which are suitable for bidding and construction purposes and for designing the preliminary plan of operation.

Operational Considerations in Design

The design of a wastewater treatment facility will greatly influence facility operation and maintenance. The design sets the stage for operation and maintenance needs and attitudes. The designer must always be aware of the relationship between O&M and plant design.



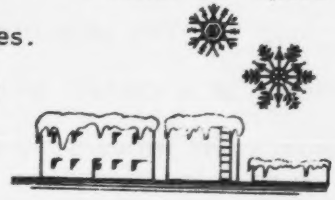
There are many design considerations that will affect the operability of the treatment facility. The reviewer should become familiar with these considerations. This will enable the reviewer to perform the review function more effectively and efficiently.

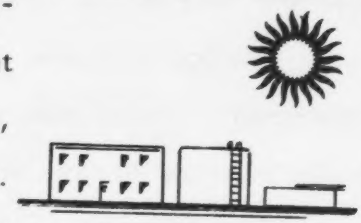
One of the first design considerations is the plant site. The site can place many restrictions on the design. The availability or shortage of land will affect the size, layout, and shape of the proposed facility. Future expansion may be limited or impossible. Environmental restrictions may make it impossible to operate or maintain the facility. For example, a plant in a swamp or flood plain will have severe O&M problems. Natural limitations of the site may create operational problems that cannot be overcome. Problems in political jurisdiction of sites may arise. These also will have to be considered and resolved. In addition, the use of existing facilities may create O&M problems and must be considered. Operational problems created by their design may be carried over into the new plant. Site constraints that may adversely affect operation and maintenance of the new facility must be considered and compensated for in the design.

The influent characteristics must be considered in the design of the treatment facility. This is why documentation of flow and load was required in Step 1. The objective of a wastewater treatment facility is to produce an effluent of a certain quality. To accomplish this, the design must allow for variation of influent flow and load. Of equal importance, when considering flow and load is the effect of "recycled loads." Allowance for supernatant liquor, sludge thickener overload, and other sludge liquor returns must be considered. These returns will cause variations in flows and loads. The design must be flexible enough to allow for efficient plant operation under all load conditions.

Plant size and its relation to simplicity and flexibility is an important operational consideration in design. During the plant design process, alternatives are compared and a selection is made. The selected design should minimize the number of unit operations required of the operator. This simplicity of design must not result in operating headaches in the future. For example, some designers have omitted grit chambers to reduce unit operations. This practice has led to many O&M problems after start-up. The reviewer should use caution when reviewing for simplicity and flexibility in design.

The layout of the plant must be done with O&M in mind. The placement of plant components on the site will affect the staff's attitude toward the wastewater treatment plant. Convenient and logical placement of plant components can reduce the amount of time and work required to operate and maintain the treatment plant. In small plants a centrally located operation building can simplify plant operation. This central location allows for ease of operation and maintenance for the operator. The operation can be controlled from one building. In large plants, satellite operation centers may be needed. The use of centrally located operation buildings or satellite buildings reduces the complexity of operation for the operator. The simpler the operation, the better the operator will perform his/her duties.





Climate needs to be considered in the design of a treatment plant. Substantial differences in design will result from an appraisal of local climatic conditions. The climate will affect drainage, component housing, protection from wind, drying bed design, materials used, and even the treatment process. Open drying beds may work in a West Texas town where evaporation is high, but it would not work in areas of high rainfall. The design should consider adverse weather and its effect on operation and maintenance. A design which is not based upon climatic conditions, including inclement weather, will result in operational problems at the proposed treatment plant. The reviewer should ensure that the designer has considered the effects of climate in the design.

Another important operational consideration in design is materials handling. The designer must recognize this, and consider what will be involved for the operator. The materials must be identified as to type, quantity, shipment sizes, frequency of delivery, and residues to be removed. Unnecessary handling of materials should be avoided.

Plant hydraulic arrangement has a dramatic effect on plant operations. The piping arrangement should be designed to allow unit removal without causing a downstream or upstream unit removal. For instance, removal of a settling tank should not cause the upstream aeration tank to be removed as well. Flow routing should be flexible to allow for various modes of operation. An example of this is to arrange piping to allow an activated sludge plant to be operated as an extended air or contact stabilization plant. Piping should allow for the equal distribution of solids and liquids. Pumping arrangements should allow one pump to pump from one unit or from several units. In general, the hydraulic arrangements should allow flexible operation.

Equipment selection has a major impact on plant operation and maintenance. The need to control the quality and special features of equipment is very important. Savings in capital outlay may be offset by increased operation and maintenance. The program requirement of "two brand names or equal" may be causing the use of inferior products or equipment in wastewater treatment plants. The plans and specifications should ensure that the equipment used is equal to the brand name in quality. This will reduce possible O&M problems.

Design of a treatment plant should embrace the concept of flexibility. Many factors which influence plant operation often change without warning. Changes such as flow and load, staff capabilities, maintenance requirements, and regulatory requirements create the need for plant flexibility. If the design allows for operational changes then O&M of the plant should be easier.

Component reliability in design is a must. Duplicate or backup systems need to be included in the design.

Safety in design is a very important consideration. It is necessary to ensure that the operator has a safe environment in which to work. If operators feel that various operational duties are unsafe, then they will not perform the necessary O&M tasks. The reviewer needs to be aware of the importance of safety in the design process and in the review process.

Operational considerations in design are very important. In order to provide for O&M considerations, the design should exhibit:

1. Flexibility: The ability to change modes of operation easily without disrupting the process
2. Operability: The ability of the operation to produce the required effluent under various flows and loads without disrupting the process
3. Maintainability: The ability to perform maintenance tasks without disrupting the process
4. Reliability: The ability to perform the designated function consistently without disrupting the process
5. Durability: The ability to function satisfactorily for a specified period of time without disrupting the process.
6. Economy: The ability to produce the required effluent at the lowest possible cost

The absence of any one of the above will reduce the operational performance of the wastewater treatment plant.

OPERATIONAL REVIEW OF PLANS AND SPECIFICATIONS

Plans and Specifications Review Techniques

To ensure that the facility to be constructed will meet effluent and statutory requirements, a review of the plans and specifications is necessary. Depending upon the complexity of the project, periodic reviews will be carried out during the preparation of the plans and specifications. The time frame for plans and specifications development can vary from one month to over a year. Review meetings should be held with the project engineer during the development of the plans and specifications, usually at the 25 percent, 50 percent, 75 percent, and 90 percent stages. During these review meetings, an operational review should be conducted. This will enable the design engineer to make corrections which will ensure effective plant operation and maintenance. The plans and specifications submitted for final review will include all changes that result from the review meetings. The final plans and specifications must undergo a rigorous review for all program requirements. This review may take anywhere from two weeks to one or two months. The reviewer has many responsibilities during this review. There are many administrative and technical items that must be included in the plans and specifications. All of these are important, but we are primarily interested in effective plant operation and maintenance. Our review will focus on operational considerations which affect plant operation and maintenance. These considerations will lead to better plant O&M.

An important step in successful plant operation is the preparation of original plans and specifications. The review should ensure that the plans and specifications meet the objectives of the treatment facility. They should provide owner (operator) control over the contract or equipment supplies as well as the contractor or equipment supplier. They should be easily read and understood. The standard operating procedure component sections should be complete. These sections should protect the owner's (operator's) interest. The contract document should clearly state the process performance specifications, performance testing, and process and equipment warranties. Most of all, the process performance specifications and tests should provide for flexibility of plant operation. The reviewer should ensure that these requirements are met in the plans and specifications.

Plans and specifications have a significant impact on the cost of operation and maintenance of the wastewater treatment facility. They should translate project requirements into the most cost-effective operating system for the owner. The plans and specifications must contain an explanation of the method of bidding and the basis for evaluation and awarding of bids. It is a common assumption that the lowest bid must be accepted. However, this is not true; EPA does not require acceptance of the lowest bid. Federal requirements state that the award must go the the lowest responsive, responsible bidder. The plans and specifications must contain guidelines stating how the bidder is to be selected. The plans and specifications should require the following items to ensure proper facility O&M:

1. Performance bonds
2. Training to be provided by equipment manufacturer
3. Dates when warranties begin
4. Performance specifications in lieu of or equal to, such as:
    a. Capacity and skill of the bidder to provide high quality equipment which will serve under stated operating conditions

b. Financial resources available for the amount of equipment to be supplied

c. Provision of future maintenance and service

d. Background of performance in providing financial security and quality services

e. Favorable price

In addition to the above, the plans and specifications should contain the following (especially if a sole source selection is desired):

1. Performance specification
2. Design specification
3. Life cycle costs
4. Energy requirements
5. Justification that:
    a. The project needs are met
    b. Operational reliability is improved
    c. There is better management of waste materials
    d. Environmental benefits are increased

Successful bidder should furnish shop drawings and information on equipment when ordered. This will aid in the timely development of the O&M manual.

The designer/reviewer should be able to recognize design defects that have been responsible for poor operation and maintenance in the past. The design must be tailored to the type of waste to be treated and must provide for adequate capacity and operational flexibility. The reviewer should become familiar with the engineering firm preparing the plans and specifications. This firm should have qualified personnel available: (1) to provide start-up service, operator training, and troubleshooting; and (2) to recognize design problems and offer solutions for their correction.

The reviewer must be aware of the function of each component of the plans and specifications. For example: What is the function of a screening device? Its purpose is to remove coarse materials that could damage or otherwise affect plant operation and maintenance. The design of the screening device varies with its application. When reviewing the design of the screening device, the reviewer must consider:

1. What is the size of particles to be removed?
2. What is the hydraulic loading?
3. What is the hydraulic gradient?

This capability can be a valuable tool in the review process. The reviewer needs to be aware of the function and application of each component of the treatment facility. This review procedure can then be developed to its fullest potential.

The development of a feedback system can assist the reviewer in benefitting from other reviewer's experiences. Incorporating these experiences will greatly improve the review process. This feedback system should be designed to identify new and improved review techniques for a more effective review. No matter how experienced a reviewer may be, valuable input can be gained from others' experiences. An important source of feedback information is data gained by reviewing existing plants with design O&M problems and their plans and specifications. The reviewer may then be able to prevent new plants from having similar problems through changes in the plans and specifications. A particular firm may continually repeat the same design error. Use of an in-house memorandum would alert all reviewing personnel to this reoccurring error. The use of a formal feedback system by reviewing agency personnel is a valuable tool in the development of effective review techniques. Such an approach will lead to better plans and specifications which in turn will result in operable and maintainable treatment facilities.

Plans and Specifications Review Operation

Along with the development of a review technique, the reviewer should use the Plans and Specifications Review Operation Checklist. This checklist (page 3-48) was developed as a guide for the reviewer. The reviewer must ensure the consideration of O&M concerns in the plans and specifications. The checklist will assist the reviewer in this process.

A design summary should be included with the plans and specifications. This summary should include:

1. A flow diagram
2. A hydraulic profile
3. The point of discharge and identification of the receiving stream
4. The initial population equivalent and flow
5. The flow and load characteristics (BOD_5, toxicity, etc.)
6. The design flow, population, and year
7. The design efficiency and effluent standards
8. The physical characteristics of treatment units
9. An identification and justification of deviations from standards, guidelines, or technical bulletins
10. The sludge disposal method
11. An explanation of any unusual design feature
12. The quantity and type of industrial waste
13. The factors in design affected by industrial waste
14. The dimensions and volume of each process unit

15. The flow rate and volume within each process compartment for minimum, average, maximum, and initial start-up flow
16. The expected BOD_5, COD, and TSS in all side streams and mix liquor returns
17. The recycle rate
18. Any anticipated chemical additives
19. A diagram of piping showing flows, flexibility of flow, and hydraulic profiles for minimum, average, maximum, and initial start-up flows
20. A schematic of the physical controls for each process compartment
21. The BOD_5, TSS, and COD removal of each process compartment
22. A list of physical control and laboratory tests for each unit
23. Estimated staffing for start-up and point at which facility reaches design capacity

The summary should also include data on the basis of design. This data should be easily understood by the reviewer and should contain a description of the project in terms of type of treatment, flow capacity, and unit process. The basis of design should state the justification of need for the project. This information lays the groundwork for the review process by explaining the process, its purposes, and procedures. This information should be read thoroughly by the reviewer.

There are many operational program requirements that must be included in the plans and specifications. The reviewer needs to ensure that all requirements are met. The reviewer should also look for operation and maintenance problems that may occur because of the design. An example of a design flaw that may appear is the lack of metering in the return activated sludge piping. Lack of meters limits the operator's control over the amount of activated sludge which is returned. This may result in a loss of process control. The reviewer must always be aware of the many design errors which can occur.

The plans and specifications must document the flow and load characteristics and should also include the effluent limitation. The design is based upon this information. The type and extent of treatment to meet the effluent limitation is keyed to the influent characteristics. There must be proof that the data used is accurate; if it is inaccurate, the plant may not be able to achieve its design purpose.

The plans and specifications must provide for operability, flexibility, and maintainability under all anticipated flow and load conditions and throughout the useful life of the treatment facility. To be operable and maintainable, the design should:

1. Provide safe and easy access to all equipment valves, gates, and other operating devices
2. Provide overhead cranes to lift major equipment and to move large or cumbersome items to different levels. The reviewer should look for obstructions that prevent use of the crane (piping running across the track, etc.)
3. Provide a good working environment in the galleries and utility tunnels; this includes drainage, ventilation, and light
4. Provide utility stations throughout the plant to ensure ease of access to wash-down water, air, stream, potable water, etc.
5. Provide openings in the floor, roof, and walls for removal of large equipment (cranes, or in some cases eyebolts for hanging chain falls, should be provided for)

6. Provide room to work for the operation/maintenance personnel

These six items will make the operator's work easier by making plant operation and maintenance easier. The design should allow the facility to operate under various loads and flows without affecting the process. The operator must be able to remove and put back on-line any unit without disrupting another unit or the entire plant. Flexibility, operability, and maintainability are all tied together. However, there is a fourth requirement that affects the other three. The design must provide for the reliability of the unit process and equipment. If a plant (or its components) is not reliable, then plant operation and maintenance is next to impossible.

The plans and specifications must state the requirements for sampling and process control equipment. Both the type and location of this equipment must be specified. Equipment should be conveniently located and should allow for efficient operation and maintenance. The process control and sampling equipment will help provide maximum flexibility of operation. The selection and location of equipment should be based upon:

1. Process requirements
2. Efficiency of each unit
3. Costs (initial and O&M costs)
4. Personnel capabilities
5. Maintenance needs
6. Facility expansion
7. Ease of access to control functions
8. Ease of performance of control functions

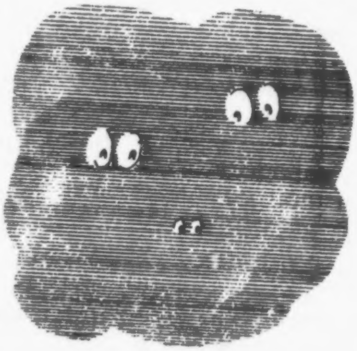
Process control equipment and sampling equipment selection must be considered in terms of plant operation and maintenance. The process control equipment must provide operator control of the treatment process and must meet the NPDES monitoring requirements. It should include such things as flow meters, variable speed pumps, and alternative flow routing. The control equipment should be located for safe operator access. Sampling equipment and locations should be adequate to meet the laboratory control program requirements of the wastewater treatment facility.

The plans and specifications should include laboratory facilities. These facilities must be adequate to conduct analyses and monitoring of pretreatment, influent, effluent, unit and plant efficiency, and process control. They should include the necessary equipment to conduct tests required by the NPDES permit or by the state agency. In addition, they should contain the necessary testing equipment needed for proper process control. A means of interpreting the results to the operator is needed as the terms used in conducting and recording the results of the test may not be understood by all operators. This data will help the operator perform the necessary functions to ensure good plant operation. The locations for sample collection must be shown on the plans and specifications. If the operator does not know where to take samples, then the lab is useless to him. The reviewer needs to become aware of the EPA publication "Estimating Laboratory Needs for Municipal Wastewater Treatment Facilities." This bulletin contains guidelines for:

1. Physical facilities
2. Staffing
3. Unit process sampling and testing needs
4. Estimation of equipment and supplies
5. Examples that illustrate equipment needs

This bulletin should be used when determining if adequate laboratory facilities are provided for in the plans and specifications.

The design must take into consideration the need for an emergency operating plan. Although the plan is contained in the operation and maintenance manual, the design can provide one of the basic elements in an emergency response plan. The design should provide a rapid and positive detection system, including alarms (with their own power source) that will warn of high water, power failure, or equipment malfunctions. The specifications should require that emergency operating instructions be furnished by equipment suppliers. The designer can use this information in the development of the O&M manual or to evaluate the equipment in terms of reliability and flexibility. This evaluation should be part of the O&M emergency plan. It will enable plant personnel to respond more effectively to emergencies affecting the equipment. The design should consider alternate power sources to be used during a power outage. The plans and specifications need to include a standby emergency power system which would assume the load when a power failure occurs. This standby system should be able to meet the required load.



Not only do the plans and specifications need to consider an emergency operating plan, they should design for emergencies such as power outages, equipment failures, flooding, etc. This would lessen the impact caused by the emergency and improve plant operation.

Safety procedures and design must be considered in the plans and specifications of the proposed treatment plant. Design safety considerations have often been neglected in the plant design. Each stage of the design must take safety into account. Many of the newly completed plants have had to be modified to create a safe working environment. Safety planning is needed to prevent unnecessary accidents and deaths. Section 204(a)(4) of PL 92-500 requires assurance of proper and efficient operation of facilities. Safety is considered an integral component of proper and efficient facility operation. It promotes operation and maintenance and helps to avoid needless shutdowns and repairs which reduces O&M costs. In addition, it creates a better working environment for operators and maintenance personnel. Operational functions are improved because operators are not subjected to unsafe working conditions.

Along with personnel safety, the design should consider the safety and operation integrity of the equipment. It must be protected from hazards (weather, vandalism, flooding, electric overload, etc.) which reduce its capacity to perform design functions.

The design must minimize operation and maintenance staffing and budget requirements. An analysis must be made of the operation and maintenance requirements for the proposed facility. The plans and specifications must contain specific recommendations for staffing (including operator qualifications) and annual budget needs for the treatment plant.

The reviewer must verify that energy requirement criteria are included in the plans and specifications. Use of the most energy efficient components and unit processes will aid in the overall reduction of O&M costs.

The reviewer should be familiar with the staffing guidelines and should be able to determine whether or not the design engineer's estimates are realistic. This can be accomplished by comparing these estimates to those recommended in the municipal wastewater staffing manuals.

Although start-up services are normally part of the Step 3 grant application, planning for these services should begin early. Requirements for start-up services have been discussed at both the preapplication and predesign conferences. The design engineer must consider those things needed to accomplish plant start-up. Plant start-up may be defined as a series of events that lead to a stabilized, routinely controlled plant, process, or unit. As the plans and specifications are being prepared, the designer should also develop the start-up services.

Applicability of Technical Bulletin

Reliability of unit processes and equipment must be incorporated into the design to ensure continuous plant operation. To ensure the reliability of unit components, EPA issued technical bulletin MCD-05 titled "Construction Grants Program Requirements: Design Criteria for Mechanical, Electrical, and Fluid Systems and Component Reliability," USEPA-430-99-74-001. This bulletin specifies operational control requirements for treatment plant design.

Flexibility is the key word in the application of the criteria. This criteria stresses component backup for reliability. However, the needed degree of reliability may be achieved through design flexibility (e.g., alternate flow routing and/or storage capabilities). The level of reliability usually comes down to a matter of cost/benefit.

The bulletin defines reliability as "a measure of the ability of a component or system to perform its designated function without failure." These requirements pertain only to mechanical, electrical, and fluid systems and components and their maintainability. Rigidity is minimized by the establishment of three reliability classifications. The document does not specify requirements for reliability classifications; however, it does define the three classes. The required reliability class depends upon the impact of the treatment plant upon the environment if the treatment process fails. The applicant selects the reliability classification based upon the definition in the bulletin. The applicant must justify its choice to the regional administrator.

Design flexibility is achieved and rigidity is avoided by:

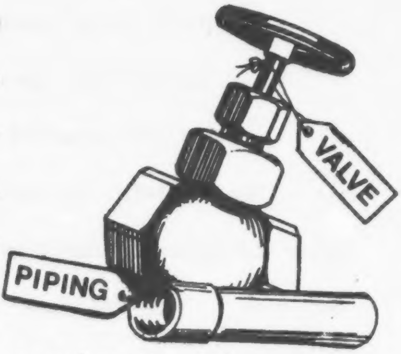
1. Having the different reliability classifications
2. Allowing alternative design criteria if supported by adequate technical justification
3. Specifying general design criteria and requiring the designer to justify specific requirements applicable to the design

This bulletin contains guidance on how to design for reliability in wastewater treatment facilities. It is an important tool for the designer and the reviewer. The reviewer should be aware of its contents and be able to use it in the review process. This bulletin is a guide which contains the requirements for facility design.

New treatment works and additions or expansions to the existing treatment works shall comply with these requirements. Portions of existing works, for which the addition or expansion is dependent for reliable operation, shall comply with these requirements to the degree practicable. There may be some treatment works for which fulfillment of some of the design criteria may not be necessary or appropriate. There will be other cases in which these criteria are insufficient, and additional criteria will be identified by the regional administrator. It is expected that additional criteria may be needed for unusual environmental conditions and for new processes. Within this context, the design criteria should be used as a reference, allowing additions or deletions as an individual case may warrant.

A basic requirement specified in these criteria is component backup. However, system reliability can also be attained through flexibility in the design and operation of system and components. This document does not attempt to define requirements for system flexibility.

The reviewer must be aware of the reliability classifications and their requirements in order to conduct an effective review. In addition, the reviewer must ensure that multiple units and equipment are provided to meet the reliability classification set for the facility. The design should allow for unit bypass which permits continuous operation of other units if something happens to any one unit. The plans and specifications should include some means of identification of all operating devices (i.e., valves, gates, drains, piping, etc.). If the operator cannot easily identify a valve or piping, the component is not very reliable. In determining reliability, the reviewer must make use of the information contained in the technical bulletin MCD-05 (cited earlier). As the review continues, the reviewer will become more aware of this information and will be able to use it more effectively.



The reviewer should look for the following items in determining treatment facility reliability:

1. Two sources of electrical power
2. Standby power for essential plant units
3. Multiple units and equipment
4. Holding tanks or basin to provide storage for overflow and adequate pump-back facilities
5. Dual chlorination units
6. Rapid mix of disinfectant with wastewater
7. Alarm systems

Inclusion of these design factors should allow for continuous plant operation during emergencies, maintenance shutdown, and power failures. The reviewer must ensure design consideration of plant reliability, flexibility, operability, and maintainability. If these O&M concerns are met, then proper and efficient plant operation and maintenance is likely to follow.

PLAN OF OPERATION

Requirements

A plan of operation is required for all federally funded wastewater treatment facilities. Guidelines for the development of a plan of operation can be found in Program Requirements Memorandum 77-3, Plan of Operation for Municipal Wastewater Treatment Facilities (PRM 77-3) and Federal Guidelines - Operation and Maintenance of Wastewater Treatment Facilities, EPA, August 1974. The Federal Guidelines and PRM 77-3 detail what should be covered by the plan of operation.

PLAN OF OPERATION

A plan of operation is a schedule of the steps and actions to be performed at a later date to ensure cost-effective, efficient, and reliable start-up and continued operation and maintenance of a wastewater treatment facility. The plan identifies and schedules the tasks to be performed during start-up and preparation of the O&M manual. It outlines the purposes, locations, and time frame of each task and the staff responsible for each task.

A plan of operation may be divided into four general areas:

1. Administration, which includes staffing, personnel qualifications and responsibilities, budget, and communication
2. Training of supervisory, operation, maintenance, laboratory, and administrative personnel, including future training needs
3. Start-up services, which provide assistance and training before, during, and after start-up
4. O&M manual, which is a written record of the first three activities

To ensure that operation is effectively considered in the three-step grants process, the development of the plan of operation must begin early.

Preparing the plan of operation begins in the facility plan of the Step 1 grants process which should include an outline of:

1. The staffing and training requirements for the proposed treatment plant
2. The organizational structure, operating authorities, O&M budget, and administrative control strategy
3. The control strategy for major unit(s) and for the entire plant

These three are the beginning of the plan of operation.

A preliminary plan of operation is required as part of the plans and specifications. It specifically explains the three general areas of the facility plan and also includes a preliminary implementing schedule. The preliminary plan of operation should contain an implementation schedule for the development of the following:

1. Staffing and training plans (training plans may be tentative)
2. Records, reports, and laboratory control systems
3. Process control and start-up procedures
4. Safety program
5. Emergency operating plan
6. Description of the maintenance management program
7. Development schedule for the O&M manual
8. Tentative operation budget
9. Tentative schedule of a sewer use ordinance:
    a. Adoption
    b. Pretreatment program
    c. Industrial use ordinance
    d. First completed annual treatment system O&M report

The preliminary plan of operation should provide a schedule which includes the following assurances:

1. A chief operator will be hired prior to 50 percent completion of construction
2. The training program will be developed and started prior to start-up
3. Staffing problems and solutions, if appropriate, have been considered
4. A list of positions and qualifications of personnel who are hired will be prepared 30 days prior to start-up, with assurance that vacancies will be filled
5. Start-up services are provided

The preliminary plan of operation should be submitted at the 50 percent completion date of the plans and specifications. The reviewer should review the plan of operation. If there are any deficiencies in the plan of operation it should be returned to the applicant for necessary corrections or amendments. A corrected final plan of operation should be submitted for state and/or EPA approval when the design is 100 percent complete.

Fulfillment of requirements of Step 1 and Step 2 will make the plan of operation a useful document in the Step 3 grants process. Step 3 implements the plan of operation. The grantee is required by 40 CFR 35.935-12 to submit timely evidence of implementing the requirements of the plan of operation for approval prior to 50 percent completion of construction. Unless timely implementation of the requirements of the plan of operation has been approved by the state and/or EPA, no more than 50 percent of the Step 3 grant will be paid. The grantee must show proof of compliance with the:

1. Hiring of the chief operator
2. Development of the training program
3. Provision for possible staffing problems and solutions
4. Provision for a list of positions filled and qualifications of personnel
5. Start-up program requirements
6. Safety program
7. Draft O&M manual

A final O&M manual must be submitted to fulfill the requirements of a plan of operation to receive 90 percent payment. Experience gained during start-up must be used to make necessary modifications of the O&M manual. This can be done before or after the 90 percent payment.

The completed items of the plan of operation should be evaluated during the final construction inspection. The inspector should assess the completed items and provide guidance for the design engineers on any incomplete item. When all items are completed, the grantee should provide the appropriate regulatory agency with a summary of procedures for certification of completion. The regulatory agency should evaluate and approve or disapprove the certification after completing an O&M survey of the facility.

Elements of a Plan of Operation

A plan of operation should contain information on each of the following areas:

1. Staffing and training
2. Records, reports, and laboratory control
3. Process control and start-up services
4. Safety
5. Emergency operating plan

6. Maintenance management

7. Operation and maintenance manual

8. Operation budget

9. Other elements

More detailed information of these elements can be found in Federal Guidelines: Operation and Maintenance of Wastewater Treatment Facilities, August 1974.

Plan of Operation Review Criteria

The plan of operation is a schedule of actions needed to assure reliable start-up and continued O&M of the treatment plant. It identifies and schedules the tasks which must be performed as part of the start-up services and preparation of the operation and maintenance manual. It should fix the responsibility of who will start up each unit process and when. Program Requirements Memorandum 77-3 contains an excellent example of a plan of operation and its contents.

The preliminary plan of operation must be reviewed along with the final plans and specifications. It should be complete, although some sections may be tentative. The preliminary plan of operation must be approved prior to the Step 3 grant approval.

All agency review personnel should recognize and use the review criteria and the Plan of Operation Review Operation Checklist (included in this unit on page 3-50). The criteria and checklist, which are designed as universal forms, may be used for the review of the preliminary plan and the final plan of operation. The complexity of a project will determine the detail of the plan of operation. The reviewer must be able to recognize and properly use PRM 77-3 when reviewing a plan of operation.

The plan of operation must contain a chronological summary of implementation dates. The format of this summary is found in PRM 77-3 (pages 10, 11, and 12).

The staffing and training plan assures that the necessary personnel are hired and trained. Qualifications should be developed for each position. There should be a provision made for hiring the chief operator by 50 percent completion of construction. A training program will be developed which includes the recommendations or requirements for state operator certification.

Records, reports, and laboratory control programs must be developed. Records serve as a guide for plant operation and process control personnel to help O&M personnel implement their duties. Records and reports are useful aids in solving plant performance problems. State monitoring personnel can use the records and reports to monitor plant O&M. The plan of operation should require the development of implementation schedules for:

1. Adequate laboratory facilities
2. Adequate laboratory equipment and supply inventory
3. Laboratory testing and process control training
4. Defining laboratory training needs
5. Monitoring, sampling, and analyzing the program for each process
6. Influent and effluent monitoring for characteristics and removal efficiency
7. Operating records
8. Special forms
9. Finalization of records and reports system

Consideration must be given to plant start-up and subsequent plant operation. The plan should require process control reviews with plant personnel and explanation of start-up procedures. All equipment should be wet and dry tested. The O&M manual will describe this section more thoroughly.

A safety program must be provided in the plan of operation and should provide scheduling for the development of an employee safety and health program. Safety training programs should be developed and conducted prior to start-up. Periodic safety training should follow.

A schedule for the development of an emergency operating plan development schedule must be submitted with the plan of operation. This schedule should include the following actions:

1. Development of details of the emergency operating plan, including personnel assignment
2. Finalization of cooperative assistance agreements with other organizations (fire, police, civil defense)
3. Prestart-up training
4. Initiation of annual procedures to update the employee training program and the emergency operating plan.

To ensure uninterrupted treatment and reduce the possibility of plant failure, a complete routine maintenance management program is needed. The plan of operation should schedule the following actions to ensure that a maintenance management program is implemented:

1. Develop a schedule for routine preventive maintenance activities
2. Complete inventory of spare parts and maintenance tools
3. Conduct personnel training on O&M of specialized equipment by suppliers (equipment manuals included)

4. Provide plant personnel with training on the maintenance management system

5. Develop a maintenance record system

6. Begin prestart-up maintenance schedule

The plan of operation should provide scheduling to ensure that an O&M manual is developed. The plan of operation should provide training for operator use of the O&M manual. A provision for updating should also be included in the O&M manual.

The plan of operation should include a schedule for preparing a sewer maintenance program. This requirement is not in PRM 77-3, but is in 40 CFR 35.935-12(b)(7), (Operation and Maintenance). If the sewer system is subject to inflow and infiltration, the plan of operation should include a schedule of cost-effective steps designed to eliminate these inflow and infiltration sources. This schedule should be completed prior to start-up. The sewer maintenance program should:

1. Incorporate both corrective and preventive O&M

2. Reduce or eliminate inflow and infiltration

Any planning process must consider budgetary constraints. Since the plan of operation is a planning process, it should address those constraints. Budget considerations should include prestart-up and start-up and as a minimum identify the operation and maintenance budget by category and cost of each.

The plan of operation will ensure the following developments:

1. An estimated annual operation and maintenance budget

2. A user charge system

3. An industrial cost recovery system

In some instances, pretreatment of wastewater is needed prior to discharge into the sewer system. The plan of operation must include a schedule of those events necessary for the development of a pretreatment program. The Federal Guidelines titled "Construction Grants Program Information, State and Local Pretreatment Programs," (EPA 430/9-76-017abc), MCD-43, (3 volumes) contains data on types of pretreatment programs. The reviewing personnel should possess these guidelines.

To assure continued efficient and reliable operation of the treatment facility, certain actions are needed. The plan of operation should include a schedule of events necessary to assure reliable operation such as:

1. Promulgation of a new sewer use ordinance
2. Promulgation of an industrial pretreatment ordinance
3. Promulgation of a sewer rehabilitation system
4. Development of user charge rate structure and ordinance
5. Development of an industrial cost recovery system and ordinance
6. Compliance with any state and/or local regulations not previously covered

As stated earlier, "proper O&M of federally funded treatment works is a must!" PL 92-500 Section 204(a)(4) states that the grantee must assure "proper and efficient operation, including the employment of trained management and operation personnel, and the maintenance of such works in accordance with a plan of operation approved by the state water pollution control agency..." This requirement is also in 40 CFR 35.935-12. Even if it was not required by law, a plan of operation would still be necessary. It is an important document in incorporating operation and maintenance considerations into the three-step construction grants process. The plan of operation requires careful review to ensure that all events, tasks, etc., are scheduled to achieve effective and efficient start-up and proper operation and maintenance during the life of the plant.

A plan of operation is not a facility operating plan. It is a plan (or schedule) for completing all O&M manual requirements. It specifies actions which must be taken to accomplish operational efficiency as quickly as possible. The reviewer must assure that essential actions are described and that the schedule for completion coincides with the projected construction and start-up date of a Step 3 grant. This will provide advance assurance that the treatment plant can achieve design criteria efficiency within a reasonable time frame.

PROBLEMS THAT MAY DEVELOP
IF O&M IS NOT CONSIDERED IN STEP 2

O&M considerations may be overlooked when designing a wastewater treatment facility. Many O&M problems have been created by design errors. Some of these problems are:

1. Lack of grit removal
2. Inadequate consideration of flow and load variations
3. Effects of climate
4. Hydraulic arrangement
5. Lack of hoists to remove pumps, large objects, etc.
6. Inefficient equipment placement

The absence of grit removal has become a problem in many small treatment plants. In an effort to economize and reduce plant units, the process of grit removal is often eliminated. This omission should cease. Grit will take up space in aeration chambers and will have to be removed. This causes plant shutdown and unnecessary expense.

The variation of influent flow and load must be considered. Many designs do not consider flow and load at plant start-up. If the low flow at start-up is not considered, many operating problems will develop. For example, meters may not register the low flow and pumps, blowers, chlorinators, and other units may be oversized. Therefore, the designer must consider all types of flows and loads when designing a wastewater treatment facility.

The effect of climate on treatment process is often overlooked. There are substantial differences in design approaches that result from various climatic conditions. The designer must consider local climatic conditions, such as adverse weather, when designing the wastewater treatment facility.

Hydraulic arrangement resulting in different modes of operation must be considered. Many designers have overlooked the importance of this. Design flexibility will greatly improve plant O&M.

The operator and maintenance personnel face many problems if hoisting equipment is not available. The ability to lift and remove pumps, motors, etc., is a must. It is difficult and time-consuming to have to dismantle a motor in order to get to a pump because there is no other means of removal. The design must provide for some means of using hoists, etc., in the removal of large, heavy pieces of equipment.

In equipment placement, the designer must consider:

1. The primary and secondary function of the equipment
2. Future plant expansion
3. Equipment controls location
4. The provision of working space for plant personnel

If the designer does not consider the above factors, then plant O&M is impaired. Some examples of problems are: venture meters may become clogged, pumps in deep pits may provide no maintenance or hoists for removal, and control panel access doors may be located near the wall, making access impossible.

Obviously, these are not all of the problems that can develop if O&M is not considered in the design. However, these problems and others can be prevented if O&M is considered in the design.

APPLICATION STEP 2

REVIEW OPERATION CHECKLIST

40 CFR 35.925-10, 35.935-12

35.920-3(c)(3)

		YES	NO	NA
1.	Does the application include a schedule or evidence of compliance with O&M requirements (40 CFR 35.925-10 and 35.935-12) including preparation of a preliminary plan of operation?			
2.	Is the cost of the preliminary plan of operation separately identified?			
3.	Has there been a change in application personnel since application for the Step 1 grant?			
4.	If yes, have new personnel been informed of O&M program requirements?			

5. Recommendation on Step 2 grant award:

Signed

Date

PREDESIGN CONFERENCE

O&M CONSIDERATIONS FOR DISCUSSION

1. Plans and specifications must emphasize operability, flexibility, and maintainability of each unit process and of the overall facility. A matrix on major design errors is being developed by the Municipal Environmental Research Laboratory and should be used when it becomes available.
2. A Preliminary Plan of Operation must be submitted with plans and specifications; 40 CFR 35.920-3(c)(3); 40 CFR 35.925-10; 35.935-12; (PRM 77-3). The grantee should be informed that noncompliance with implementation dates could result in punitive actions.
3. Staffing and training analysis:

   The facility must be designed to operate effectively with the minimum number of O&M staff. Considerations include:

   a. Availability and skills and existing facility personnel
   b. Additional personnel and skills needed
   c. Personnel training needs prior to plant start-up
4. Emergency operating plan should cover the following as a minimum:
   a. Effects of emergencies
   b. Vulnerability analysis of the system
   c. Protection measures
   d. Emergency response program
5. Flexibility on routing flows is necessary to permit:
   a. Process control
   b. Maintenance of process units
   c. Emergency operation
   d. Process control proceeding

    e. Sludge disposal
    f. Sampling procedures
    g. Effluent standards

6. A preventive maintenance program, including a records system, is to be designed and initiated prior to facility start-up.
7. Influent, effluent, and process control laboratory testing, including sampling locations, is to be established.
8. Operating budget, user charge, and industrial recovery system are required and must be available.
9. Start-up service requirements include a subagreement proposal (e.g., for consultant services) which is drafted for submission with the Step 3 grant application (PRM 77-2).
10. Sewer use ordinance requirements should be discussed.
11. Pretreatment ordinance requirements should be discussed.
12. Line item costs must be determined for:
    a. Plan of operation preparation
    b. Start-up services subagreement
    c. O&M manual preparation
13. Periods of raw sewage bypassing and other facility treatment disruptions which violate discharge permit conditions must be avoided during new facility construction.
14. Influent characteristics must be documented for design purposes.

NOTE: Conferences should be required.

If no predesign conference is scheduled, send this list to grantee along with the Step 2 grant offer letter.

All information covered in the preapplication conference should be reviewed again.

PLANS AND SPECIFICATIONS

REVIEW OPERATION CHECKLIST

	YES	NO	NA
1. Has a design summary been included in the plans and specifications?	___	___	___
2. Has an organized, systematic, basis of design been provided?	___	___	___
3. Has grantee confirmed the influent characteristics (flow and load) used for design purposes?	___	___	___
4. Do the plans and specifications adequately provide for operability, flexibility, and maintainability under all anticipated flow and load conditions (e.g., organic, industrial, seasonal, and in-plant side streams) over the useful life of the facility (including start-up)?	___	___	___

NOTE: A matrix on major design errors will be used. This matrix is being developed by the Municipal Environmental Research Laboratory.

	YES	NO	NA
5. Has reliability of unit processes and equipment been considered adequately?	___	___	___
a. Are means of assuring continuous operation, including alternative sources, provided?	___	___	___
b. Have multiple units and equipment been provided to the maximum extent possible?	___	___	___
c. Can individual plant units be bypassed?	___	___	___
d. Are there adequate provisions for flexibility of operation?	___	___	___

		YES	NO	NA
e.	Is the treatment process suitable for the character and volume of the sewage to be treated?	___	___	___
f.	Are all operating devices, including valves, gates, drains, pumps, motor starters, switches, sensors, gauges, recorders, fans, heaters, chlorinators, piping, manholes, etc., numbered, labeled, or otherwise identified in a manner that can be utilized and incorporated into the operation and maintenance manual?	___	___	___
6.	Have the location requirements for process control equipment and sampling equipment been defined adequately?	___	___	___
7.	Are the planned laboratory facilities adequate for pretreatment, influent, effluent, process control, and monitoring and analysis?	___	___	___
8.	Has the need for emergency operating procedures been considered?	___	___	___
9.	Have plant safety requirements been met?			
a.	Is the plant fenced or otherwise enclosed?	___	___	___
b.	Is the plant area well-lighted to provide safe nighttime operation?	___	___	___
c.	Is the public water supply protected by a backflow preventer?	___	___	___
d.	Is mechanical ventilation provided where required?	___	___	___
e.	Are railings and machine guards provided?	___	___	___
f.	Are liquid chemical storage areas properly curbed to hold the stored volume of liquid chemicals in each area?	___	___	___
g.	Is drainage from chemical storage and work areas adequate?	___	___	___

		YES	NO	NA
h.	Is adequate ventilation provided in areas where chemical mist or dust might be present?	___	___	___
i.	Are chemical piping or transporting systems labeled and provided with splash guards and other devices for protection of operating personnel?	___	___	___
j.	Is an eye wash fountain and/or safety shower located within 25 feet of each location where hazardous chemical exposure might occur?	___	___	___
k.	Is a continuous and adequate supply of potable water available for all eye wash fountains and safety showers?	___	___	___
l.	Will an audible alarm system be activated when an eye wash fountain or safety shower is in use?	___	___	___
m.	Are all chemical storage containers properly labeled?	___	___	___
n.	Are chemical storage areas cool and dry?	___	___	___
o.	Are separate areas provided for chemicals which react violently with each other?	___	___	___
p.	Is adequate and appropriate storage space provided for all safety equipment (i.e. masks, goggles, etc.)?	___	___	___
q.	Are adequate and appropriate storage facilities for emergency first aid equipment provided in close proximity to each hazardous area?	___	___	___
r.	Are adequate and appropriate signs posted in all areas where hazardous chemicals are stored or used?	___	___	___
s.	Is an adequate number of appropriate fire extinguishers provided?	___	___	___
10.	Has facility been designed to minimize O&M staffing and budget (including energy requirements) consistent with satisfactory performance? (How does the project plant staff compare with recommendations from POTW staffing manual?)	___	___	___

YES NO NA

11. Have start-up service requirements been adequately considered? ___ ___ ___

12. Has a preliminary plan of operation been submitted and approved? (40 CFR 35.925-10 and 35.935-12) ___ ___ ___

NOTE: Ref. PRM 77-3 to assess the following:

a. Do elements II through V and VII have essentially complete descriptions and schedules? ___ ___ ___

b. Is the staffing plan of I completed? ___ ___ ___

c. Is the training plan of I tentative? ___ ___ ___

d. Are tentative descriptions and schedules for VI, VIII, and IX provided? ___ ___ ___

13. Has provision been made for a user charge system to fund operation and maintenance? ___ ___ ___

14. Summary comments and recommendations:

a. Are plant (unit process) design and equipment specifications adequate with respect to operability, flexibility, and maintainability?______________________________

____

b. What progress has grantee made in meeting O&M requirements?

____

____

c. What are the recommendations for plans and specifications approval?

____

____

d. Have O&M costs been considered for the following?

1) Salaries ___ ___ ___

2) Energy needs/costs ___ ___ ___

	YES	NO	NA
3) Chemical costs	___	___	___
4) Parts and supplies	___	___	___
e. Does the budget need to be revised?	___	___	___

Signed______________________________

Date________________________________

PLAN OF OPERATION

REVIEW OPERATION CHECKLIST

(for Preliminary and Final Plan of Operation)

	YES	NO	NA
1. CHRONOLOGICAL SUMMARY OF IMPLEMENTATION DATES (noncompliance could result in punitive actions)	___	___	___
2. STAFFING AND TRAINING (Schedule Provided?)			
(Dates for implementation)			
a. Identification of personnel requirements	___	___	___
b. Hiring of chief operator by 50 percent completion of construction	___	___	___
c. Hiring of other operation and maintenance personnel	___	___	___
d. Hiring of management personnel	___	___	___
e. Identification of and provisions for training needs (basic, upgrade, and start-up)	___	___	___
f. Identification of staffing and training problems 60 days prior to start-up.	___	___	___
g. Submission 30 days prior to start-up of an itemized list of positions filled and the qualifications of personnel employed	___	___	___
h. Assurance that all positions will be filled 30 days prior to start-up	___	___	___
i. Identification of pre-operational training activities at 50 percent completion of construction	___	___	___
j. Submission of training plan for continuing training 30 days prior to start-up	___	___	___
3. RECORDS, REPORTS, AND LABORATORY CONTROL			
(Schedule Provided?) (Dates, etc.)	___	___	___
a. Adequate laboratory facilities completed	___	___	___

		YES	NO	NA
b.	Adequate laboratory equipment installed and supplies inventory on hand	___	___	___
c.	Development of laboratory testing/process control training	___	___	___
d.	Development of laboratory training needs defined	___	___	___
e.	Development of appropriate monitoring, sampling, and analysis program for each process	___	___	___
f.	Development of a program to confirm influent and effluent characteristics and removal efficiencies (suggest influent sampling begin at 50 percent completion of construction)	___	___	___
g.	Development of plant operating records to be filed with proper state and federal agencies	___	___	___
h.	Development of plant process control records	___	___	___
i.	Development of special forms and records	___	___	___
j.	Finalization of records and report systems	___	___	___
4.	PROCESS CONTROL AND START-UP PROCEDURES (Schedule Provided?) (Dates, etc.)	___	___	___
a.	To be described in operation and maintenance manual	___	___	___
b.	To be updated in revision of O&M manual based upon actual operation experience obtained during plant start-up period	___	___	___
c.	To indicate who will start up each unit process and date	___	___	___
5.	SAFETY PROGRAM (Schedule Provided?) (Dates, etc.)	___	___	___
a.	To be described in operation and maintenance manual	___	___	___
b.	Safety training to be given as a part of start-up training	___	___	___

	YES	NO	NA
6. EMERGENCY OPERATING PLANT (Schedule Provided?) (Dates, etc.)			
a. To be described in operation and maintenance manual			
b. To be updated in revision of O&M manual based upon actual operation experience obtained during plant start-up period			
c. Emergency operation procedures training to be given as part of start-up training			
7. MAINTENANCE MANAGEMENT PROGRAM (Schedule Provided?) (Dates, etc.)			
a. To be described in operation and maintenance manual			
b. To be updated in revision of O&M manual based upon actual operation experience obtained during plant start-up period			
c. Maintenance management training to be given as part of start-up training			
8. OPERATION AND MAINTENANCE MANUAL PREPARATION (Schedule Provided?) (Dates, etc.)			
a. An operation and maintenance manual will be developed pursuant to Public Law 92-500 in accordance with applicable rules and regulations			
b. Operation and maintenance manual revision or update after plant has been placed in operation and plant process reaction has stabilized			
c. Instruction in operator use of O&M manual to be given as a part of start-up services			
9. SEWER MAINTENANCE PROGRAM			
10. OPERATION AND MAINTENANCE BUDGET REQUIREMENTS (Schedule Provided?)			
a. Prestart-up budget			

	YES	NO	NA
b. Start-up budget	___	___	___
c. Identification of operation and maintenance budget by category	___	___	___
1. Salaries and wages	___	___	___
2. Operation	___	___	___
3. Utilities	___	___	___
4. Chemical (used for operational purposes)	___	___	___
5. Maintenance	___	___	___
6. Training	___	___	___
7. Upgrading and raises	___	___	___
8. Grounds maintenance	___	___	___
9. Laboratory costs	___	___	___
10. In-house contracting	___	___	___
11. Outside contracting	___	___	___
12. Contingency fund	___	___	___
13. Total operation and maintenance budget	___	___	___
d. Establishment of procedures for the preparation of an annual O&M budget report including staffing, training, budget planning, maintenance, and future construction	___	___	___
e. User charge rate structure			
f. Industrial cost recovery usage for O&M budget	___	___	___
11. PRETREATMENT PROGRAM DEVELOPMENT			
(Schedules, if required)	___	___	___
12. OTHER ELEMENTS			
a. Promulgate new sewer use ordinance	___	___	___
b. Promulgate industrial pretreatment ordinance	___	___	___

		YES	NO	NA
c.	Sewer system rehabilitation			
d.	Development of a user charge rate structure and ordinance			
e.	Development of an industrial cost recovery system and ordinance			
f.	Compliance with any state/local regulations not previously addressed			

13. RECOMMENDATION ON PLAN OF OPERATION

APPROVAL ______________

Pursuant to CFR 35.925-12

Signed________________________

Date__________________________

O&M CONSIDERATIONS

STEP 3

CONSTRUCTION GRANTS PROCESS

UNIT 4

UNIT FOUR

OBJECTIVES

Following the Unit Four presentation, the participant will be able to:

1. Recognize and discuss Step 3 of the Construction Grants Process.
2. Identify and discuss operation and maintenance requirements in the Step 3 application.
3. Explain the responsibilities of each participant in the preconstruction conference.
4. Recognize and explain the operation and maintenance payment conditions of:
   a. O&M manual
   b. User charge system
   c. Industrial cost recovery system
   d. Sewer use ordinances
   e. Sewer system rehabilitation program
5. Recognize and explain the purposes for O&M manual development.
6. Determine and discuss the contents of the O&M manual.
7. Utilize the review criteria and checklist during O&M manual evaluation.
8. Discuss problems that may develop if O&M is not considered in Step 3.

UNIT FOUR

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OVERVIEW OF THE STEP 3 PROCESS

Step 3, Application

The Step 3 application should include:

1. Application form
2. Service agreements
3. UC/ICR system schedules
4. Sewer rehabilitation schedule
5. Plan of operation schedule

Both the state and/or EPA must approve the Step 3 application.

Step 3, Construction

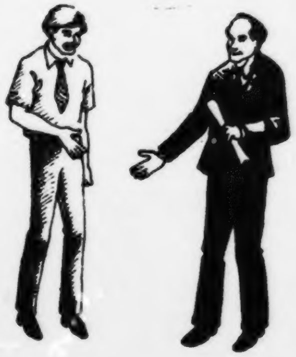
After the state and/or EPA has approved the application it will authorize the grantee to advertise for bids. Grantees must circularize the proposed project as widely as possible in order to get the maximum number of bidders.

Receipt and Review of Bids

Bids must be sealed and opened publically. The grantee will review the bids and prepare a recommendation for award. Bid documents are then forwarded to the state and/or EPA for approval.

Award of Construction Contracts

After the state and/or EPA has received and reviewed the bid information it will authorize the awarding of the contracts. At the time of the award, a preconstruction conference should be scheduled.



Preconstruction Conference

The grantee, contractor, state agency, and EPA may hold a preconstruction conference. Subjects to be discussed include the following O&M Considerations:

1. O&M manual
2. Start-up services
3. Plan of operation
4. Staffing and training plan
5. Operating budget
6. Sludge disposal

Onsite Inspections

The state, EPA, and/or Corps of Engineers may conduct onsite project inspections. These onsite project inspections are made during construction (interim) and at the completion of the project (final).

OPERATIONAL CONSIDERATIONS

STEP 3

O&M Requirements in the Step 3 Application

The application package includes many O&M items. An Application Review Operation Checklist has been developed to confirm that all O&M items have been completed (refer to page 4-52). The reviewer should conduct a preliminary review of the Step 3 grant application utilizing this checklist.

Following the preliminary review, an indepth review is conducted which further ensures that all items affecting operation and maintenance are included and specific action is proposed by the applicant which will assure prompt and efficient O&M of the wastewater treatment facility.

Plans and Specifications

The application must include approved plans and specifications. The reviewer should confirm that the plans and specifications have been approved.

Plan of Operation

The applicant must also include an approved preliminary plan of operation. A completion schedule for the development of the final plan of operation is required. The cost of the final plan of operation must be identified as a separate item. This will enable the reviewer to determine if the cost of the final plan of operation is reasonable and if provision for funding approval can be made. The proposed scope of work must be able to achieve efficient start-up and continuous plant operation. The reviewer must ensure that the completion schedule will lead to an approvable plan of operation. The application must also include an acceptable architectural-engineering subagreement or method of award for the preparation of the final plan of operation. The reviewer must check this agreement to make sure it will lead to an approvable final plan.

EPA Application Form

The reviewer must be aware of O&M concerns and their relation to EPA Application Form 5700-32. This serves as the formal application for a construction grant. In addition, it states necessary grant qualifications including the applicant's assurance that it will satisfy all statutory requirements. This form must be signed by an authorized representative of the applicant and show that the applicant has the legal authority to finance, construct, operate, maintain, and collect revenues needed for O&M. A properly executed assurance form states that all statutory requirements (including those listed in 40 CFR 35.935-12) will be complied with.

Contracts, Subagreements, and Completion Schedules

Proposed contracts and subagreements will be submitted by the applicant. These will be reviewed by both the state and/or EPA to ensure that the scope and nature of the proposed services are sufficient to construct approvable facilities. Proposed completion schedules must be reasonable and in agreement with the plans and specifications and the plan of operation. The reviewer should check to see if the fees to be charged by the contractor are reasonable.

The application will also include the following items which may have an effect on O&M program requirements:

1. Sewer use ordinance
2. Operation and maintenance scheduling
3. Sewer system rehabilitation scheduling

4. Institutional agreements
5. User charge system
6. Industrial use ordinance
7. Pretreatment ordinance
8. Industrial cost recovery system

Proof of Compliance

Proof of compliance with 40 CFR 35.920-3(c)(3) Contents of Application, 40 CFR 35.925-10 Operation and Maintenance Program, and 40 CFR 35.935-12 Operation and Maintenance must be furnished by the applicant. Grant payments will be limited until these requirements are complied with.

If the Step 3 grant includes a sewer system rehabilitation program, a completion schedule must be submitted. This schedule must be reasonable for the work involved, because it must be complied with before full grant payment can be made.

The applicant will have jurisdictional control over all political entities in the service area. This is necessary to assure adoption and enforcement of the ordinances, user charge, and industrial cost recovery system. Without this control, proper and efficient operation and maintenance becomes impossible.

Operation and maintenance of the wastewater treatment facility must be budgeted for. The applicant must submit an approvable user charge and industrial cost recovery system.

The applicant must also submit evidence of the development of an industrial use ordinance and a pretreatment program ordinance. These are needed if there are industrial users discharging toxic or incompatible waste which requires pretreatment prior to discharge into the collection system. These ordinances may be part of the sewer use ordinance.

Development of O&M Manual and Budget

The applicant must provide a schedule for the development of an O&M manual. The cost of preparing this manual must be shown separately and be easily identified from other costs.

The applicant must submit an estimated O&M budget including expected costs and revenues for the first year of operation. The reviewer should determine if the budget is adequate for the project.

Staffing and Training Plan

A staffing and training plan must be submitted as part of a Step 3 grant. It must provide a schedule for the hiring of staff and implementation dates for training programs. In addition, it must include a salary schedule and training budget which will attract qualified operators and fund a reliable training program.

Start-Up Services

The application should include a provision for start-up services and an acceptable subagreement or intended method of award for start-up service.

The reviewer should then schedule a preconstruction conference with the grantee, engineering firm or consultant, contractor, the state, and EPA. This conference should be held prior to construction.

Applicability of O&M Requirements of Step 3

The O&M requirements of Step 3 apply to all grant fundable items such as:

1. The treatment facility
2. Pumping station
3. Interceptor sewers

4. Force-main sewers
5. Collector sewers

OPERATION CONSIDERATIONS FOR PRECONSTRUCTION CONFERENCES

Objectives of Preconstruction Conference

A preconstruction conference should be held with the grantee, the grantee's consultant, the contractors, the state, the EPA, and the inspector. The objective of a preconstruction conference is to discuss the responsibilities of each party in the project.

Preconstruction conferences are not mandatory. For the construction grants program to be effective this conference should be held. The preconstruction conference provides the final opportunity to discuss program requirements prior to construction. It gives the regulatory agency another chance to reemphasize O&M requirements. It will serve as a means to introduce program requirements to new personnel (contractors, mayors, city managers, etc.).

When conducting a preconstruction conference the reviewer should keep account of the operational considerations covered at the meeting. Preconstruction Conference Operation Considerations for Discussion Checklist has been developed to aid the reviewer in covering the required O&M considerations (refer to page 4-60). Utilization of this checklist ensures that O&M concerns are considered in Step 3 projects.

Responsibilities of Grantee

The grantees should be advised of their responsibilities to comply with all state and local laws and ordinances. They may believe their only responsibility is to comply with federal program requirements, but they must be aware of their responsibilities to comply with all local, state, and federal laws both in the construction process and in subsequent plant operation.

The grantees must have an approved preliminary plan of operation. This should have been part of the final plans and specifications and the Step 3 grant application.

The grantees must have submitted a start-up proposal for approval if grant participation is desired. This is necessary to assure funding eligibility.

The grantees will be informed of the submission requirements for completion schedules of:

1. The final plan of operation
2. The draft O&M manual by 50 percent payment
3. The final O&M manual by 90 percent payment
4. Staffing and training
    a. The chief operator should be hired by 50 percent completion of construction
    b. The training program should be developed and implemented prior to start-up

These items must be approved by the regulatory agency.

The grantees must be informed of the requirement for submission of:

1. A user charge system
2. An industrial cost recovery system
3. A sewer use ordinance

The reviewer should explain each ordinance and how it affects O&M. Funds for O&M can come from the user charge system and industrial cost recovery system.

The sewer use ordinance prevents new sources of inflow, regulates new connections, provides for pretreatment if needed. This ordinance helps to assure proper plant performance by reducing and eliminating new sources of inflow, hydraulic and organic loading, and possible sources of wastewater harmful to the treatment process.

The reviewer should discuss 40 CFR 35.935-8, Supervision. This section requires the grantees to provide and maintain competent and adequate engineering supervision and onsite inspection during construction. The grantees must have their own inspector to assure that construction conforms to approved plans and specifications.

The grantees must be aware of their responsibility to maintain sewage treatment during the construction of new facilities. The reviewer should explain that the passage of raw sewage must be prevented. The construction of new facilities does not relieve the applicant of the responsibilities for sewage treatment since these responsibilities are continuous.

The grantees must provide ongoing protection and maintenance for equipment in storage, during construction, and before and after start-up.

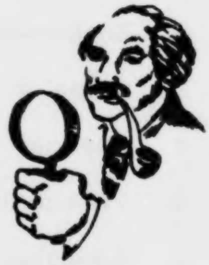
The influent characteristics upon which the design criteria were based must be confirmed. This is a responsibility of the grantees. Sampling and analysis of the influent should begin early (no later than 50 percent completion of construction). The reason for this is obvious. If the influent characteristics upon which the plans and specifications were based were wrong, there still would be time to correct the design criteria.

The grantee will be selecting contractors to work on the wastewater facility. Some of the qualifications the grantee should look for are:

1. Specialized experience and technical competence
2. Past record and performance on fullfilling contractual obligations
3. Capacity to perform the work required within time limitations (the firm's current workload must be considered)

4. Familiarity with the types of problems applicable to the project
5. Avoidance of conflict of interests
6. Philosophy on community development (which may conflict with the applicant's philosophy
7. The contractor's previous proposals
8. Other projects constructed by the contractor
9. Cost overruns
10. Change orders
11. Completion times

Responsibilities of Inspector



Wastewater treatment facilities constructed with federal funds are subject to inspection by the state, EPA, and/or Corps of Engineers. The grantee should be made aware of this by the inspector or reviewer. The reviewer or the inspector, if possible, should explain the who, why, what, when, and how of the inspection process. The grantee should be reminded that although interim and final inspections are made, others may be conducted.

Responsibilities of Reviewer

PR
77-3
40 CFR
35 920-3

The reviewer should remind the grantee that the treatment facility must be constructed according to approved plans and specifications. Project changes must be approved by the state and/or EPA prior to being executed if they: (1) alter the design or scope of the project, (2) alter the type of treatment, or (3) require additional federal funds. Changes resulting from minor errors in the plans and specifications or changes of an emergency nature do not require prior approval. All changes, no matter how minor, should be noted.

The reviewer should carefully explain 40 CFR Appendix C-1 Required Provisions--Consulting Engineering Agreements and Appendix C-2 Required Provisions--Construction Contracts which are very important to the grantee and the consulting engineer. The reviewer should cover the following items in the appendices:

Appendix C-1--Required Provisions--Consulting Engineering Agreements details the requirements for the following:

1. General
2. Responsibility of the Engineer
3. Scope of Work
4. Changes
5. Termination
6. Remedies
7. Payment
8. Project Design
9. Audit; Access to Records
10. Price Reduction for Defective Cost or Pricing Data
11. Subcontracts
12. Labor Standards
13. Equal Employment Opportunity
14. Utilization of Small or Minority Business
15. Covenant Against Contingent Fees
16. Gratuities
17. Patents
18. Copyrights and Rights in Data

Appendix C-2--Required Provisions--Construction Contracts details the supplemental general conditions for the following:

1. General
2. Changes
3. Differing Site Conditions
4. Suspension of Work
5. Termination for Default; Damages for Delay; Time Extensions
6. Termination for Convenience
7. Remedies
8. Labor Standards
9. Utilization of Small or Minority Business
10. Audit; Access to Records
11. Price Reduction for Defective Cost or Pricing Data
12. Covenant Against Contingent Fees
13. Gratuities
14. Patents
15. Copyrights and Rights in Data
16. Prohibition Against Listed Violating Facilities
17. Buy American

It is important that these appendices be understood by all personnel involved. If the responsibilities outlined in them are followed, an operable facility will be ensured.

Finally, the reviewer should restate the responsibilities of the grantee to properly and effectively operate and maintain the wastewater treatment plant. Special attention should be given to 40 CFR 35.935-1 Grantee Responsibility.

O&M CONSIDERATION PAYMENT CONDITIONS OF STEP 3

Schedule of Payment

Generally, Step 3 grant payments are made according to a payment schedule which is included in the grant agreement. The grantee must request payment on form 2550-16 and supply support documentation. EPA will review this form and authorize payment as appropriate. However, the grantee must fulfill the O&M requirements before full payment will be made.

Submission of O&M Manual

The grantee must submit a draft O&M manual. No more than 50 percent of the federal share may be paid until this is accomplished. No more than 90 percent payment may be made until the final O&M manual is approved by the state and/or EPA (40 CFR 35.935-12).

Submission of User Charge System

A user charge is a charge levied on users of a treatment works, or that portion of the ad valorem taxes paid by a user for the user's proportional share of the operation and maintenance cost (including replacement). The grantee must have submitted a schedule for the development of a user charge system during Step 2. During Step 3, the grantee must begin to develop the user charge system. The system must meet the objective of distributing O&M costs among all users in proportion to their waste load. The user charge shall be based upon volume, flow rates, and strength of the wastes of all users. The cost of O&M must be equitable to each user or class of users. The user charge system should bring about operational self-sufficiency.

Submission of Industrial Cost Recovery System

Public Law 92-500, Section 204 (b)(1)(B) requires that the grantee develop and implement an industrial recovery system. This system provides the means by which industrial users repay the proportionate federal share of the construction cost of a publically-owned treatment facility. The cost shall be recovered by the grantee during the useful life of the facility or within 30 years, whichever is less.

The grantee must:

1. Identify personnel responsible for the development of the industrial cost recovery system by 50 percent payment of the Step 3 grant and submit a detailed completion schedule for the industrial cost system.
2. Submit a description of the industrial cost recovery system by 80 percent payment of a Step 3 grant.

Submission of Sewer Use Ordinances

The grantee must submit a sewer use ordinance and other legally binding sewer use requirements for approval by the state and/or EPA by 80 percent payment of the federal share of a Step 3 grant. These ordinances can include a sewer use ordinance, an industrial use ordinance, a pretreatment program ordinance, or a combination of all three. These ordinances must assure that no new sources of inflow are connected to the sewer and that new connections are properly designed and constructed. In addition, the ordinances may regulate the type of waste discharge, require some type of pretreatment, require permits by industrial users, and provide for disconnection and its penalty.

These ordinances should provide the mechanism for controlling all discharge of waste into the sewer collection system. This is necessary to prevent disruption of the treatment process.

Submission of Sewer System Rehabilitation Schedule

In the Step 1 application process, the applicant determines by an inflow and infiltration analysis and sewer system evaluation survey if a rehabilitation program is necessary. If rehabilitation is necessary, the applicant must submit a sewer system rehabilitation schedule. This schedule must detail the completion dates of the work needed to correct the inflow/infiltration conditions. Completion dates should be reasonable for completion of work prior to start-up. If rehabilitation is deemed unnecessary, the applicant need only submit written assurance that no excessive inflow and infiltration exists.

No more than 80 percent of the federal share of a Step 3 grant may be paid before the rehabilitation program has been complied with.

O&M MANUAL DEVELOPMENT

What Is an O&M Manual?

When a wastewater treatment problem has been carefully studied, several solutions are considered. The final solution is selected after evaluating all of the alternatives. Then the facility is designed to solve the wastewater pollution problems. This design is based upon influent characteristics and the desired effluent quality.

The designer has definite and specific objectives for each unit and each process of the treatment facility. These design objectives can only be achieved if the plant operator and the owner know and understand the design objectives and effectively operate the wastewater treatment plant to meet them. Using a properly prepared O&M manual is the most effective way of informing the plant operator and owner of the designer's objectives.

An O&M manual is a document that provides simple necessary instruction to operating personnel while listing the daily tasks necessary to achieve the design objectives. The manual must explain the reason for the system, identify each unit and its function, and tell how each unit's performance affects the performance of all other units in the system. From this explanation, the operator will understand the system and the need to operate the plant as a unified system to achieve optimal performance.

The manual must clearly explain, as simply as possible, the operator's responsibilities and duties of operating and maintaining the treatment plant to continuously achieve high effluent quality within the budget limitations set by the plant's owner. It must explain the plant process and provide overall process control guidance. In addition, the manual should explain the daily routine procedures needed to ensure proper plant performance. The guidances and daily routines must be incorporated into an overall operation and maintenance system and plan to ensure that all tasks needed for proper O&M are completed correctly.

What Are the Purposes of an O&M Manual?

The O&M manual is a reference manual used by plant operation and maintenance personnel as a guide in keeping the treatment plant operating effectively. The O&M manual is also designed as a training manual to be used as a study guide during the training of plant operating personnel during start-up and start-up training.

When Is an O&M Manual Prepared?

The regulations state:

> "The Regional Administrator shall not pay (1) more than 50 percent of the Federal share of any Step 3 project unless the grantee has furnished a draft of the operation and maintenance manual for review, or adequate evidence of timely development of such a draft, or (2) more than 90 percent of the Federal share unless grantee has furnished a satisfactory final operation and maintenance manual."

Interpretation of item (1) differs from EPA region to region and from state to state within the region. Unfortunately, the phrase "evidence of timely development" is used to obtain the 50 percent payment even when noticeable progress has not been made toward the development of the O&M manual. All regions and states require approval of the final O&M manual prior to final payment.

O&M manual preparation should begin early. If the design engineer waits until Step 3, many benefits of early O&M manual preparation are forfeited. The use of the O&M manual as a design tool is lost. The designer may not be able to correct design deficiencies during the design phase. Instead (since the plans and specifications are already approved) the time-consuming and costly change order procedure must be used. Sometimes it is too late to make changes. As a result many changes that could make the facility more operable, flexible, and reliable in meeting effluent standards are not incorporated into the facility design.

O&M manual preparation should begin at the same time the facility plan (Step 1 grant) is being developed. Much of the information included in the facility plan is also included in the O&M manual. The appropriate sections (permit and standards, personnel, laboratory testing, utilities, and emergency operating plan) could be prepared to serve dual functions of meeting the facility plan and the O&M manual requirements. Since the facility plan is an engineering report, some editing and format changes would be needed. However, the changes needed could be minimized if the sections are prepared for maximum dual use.

The preparation of the O&M manual should begin no later than the preparation of the plans and specifications. In preparing plans and specifications, the design engineer designs the entire wastewater treatment plant in detail. The design engineer must assure that flexibility has been considered to the utmost in the design by considering all requirements for pipes, gates, meters, valves, flow channels, etc. If a description of each step envisioned by the design engineer for facility operation was prepared and explained at this time and an explanation was given of why each unit was included, then the process controls and operational procedures of the O&M manual for the facility would practically be written. The process controls and operation procedures will need to be finalized when specific equipment is selected and installed.

Developing the O&M manual concurrently with the plans and specifications will identify unique operational requirements. This enables the designer to develop specifications accordingly, results in tighter and better specifications, and assures that design and operational requirements are met. Editing will be needed for a readable and usable O&M manual.

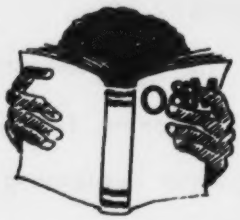
During preparation of plans and specifications some portions of the O&M manual can be completed, such as schematic drawings and the O&M budget. When this is completed, the requirement for a plan of operation is essentially finished.

Prior to the construction phase, most of the O&M manual should be completed. Final touches can be made during construction to ensure that the final manual reflects "as built" conditions. Editing for operator readability and the addition of more detailed information produces a readable and usable manual.

When the final O&M manual has been drafted, submitted, and approved, final payment can be made. The O&M manual requirement has not been met until the manual has been tested, carefully reviewed, and updated after plant start-up and operation. Any defects should be noted and corrective action taken. An O&M manual must be subject to change if it is to be a useful reference.

O&M MANUAL CONTENTS

Elements of an O&M Manual



The manual should contain useful information for the plant operation and maintenance personnel. The writing style and format should be easily understood by the operator. Any data not directly related to facility operation and maintenance should be summarized in the appendices of the manual.

As a minimum the manual should contain:

1. An introduction
2. A permit and standards section
3. A simple description of the operation and control of the wastewater treatment facilities, including sludge treatment and handling
4. A description of personnel requirements
5. A laboratory testing section
6. A records section
7. A maintenance management section
8. An emergency operation and response program
9. A safety program
10. A utilities section including electrical power sources
11. An appendices of helpful information

The introduction or overview should introduce the entire wastewater treatment system to the operator. It should present broad concepts of the treatment system and introduce the treatment plant's overall performance objectives. This section should describe the type of waste treated and its sources and the sewer system and its possible problems. This description should not be lengthy, but should inform the operator of the type of raw wastewater that will be treated and how to cope with sewer system-induced problems.

The overview should describe the wastewater treatment process in great detail covering flow patterns for both solids and liquids in the plant, identifying and explaining the different components and processes in treatment of wastewater and sludge, and giving the performance objectives of each unit. The design engineer should explain why the particular treatment sequence was chosen over other alternatives. The overview must stress the importance of operating the treatment facility as a complete system rather than individual units, explaining how each unit process works, and its relation to other processes. The operator must realize the importance of keeping each component functioning properly if the treatment plant is to achieve its performance objective.

Operational flexibility, including flexibility of flows and modes of operation, should be covered in the overview. It should be stressed that operational flexibility can be used to maintain a consistently high quality of effluent.

The overview should also include the operator's goals and responsibilities to ensure continuous effective plant operation. The purpose of the goals and responsibilities should also be included in this section. The operator's importance as a water quality and health protector must be stressed. The overview should also briefly discuss the regulations, permits, and standards that apply to the treatment facility. These should be presented in a manner that establishes compliance with permits, standards, and regulations of the operator's responsibility for proper and effective operation and maintenance.

The permits and standards section is written for the plant operator, but city officials and the public should also be considered when writing this section. The section can be used to convey the importance of the plant operation and maintenance staff and the need of continuous upgrading of operating skills through training.

The manual must explain each unit process in terms of operation, process control, and maintenance which is perhaps the most important part of the O&M manual. The explanation of each unit process given in the overview is expanded in this section to include:

1. Process description
2. Operation principles
3. Process control procedures
4. Preventive maintenance
5. Process troubleshooting
6. Emergency operation and maintenance

A complete description of the process must be given including the process characteristics and how they relate with other processes. A schematic of the processing unit with three-dimensional drawings showing piping of all flows and utilities should be included. Several drawings may be needed. All related equipment (pumps, gauges) should be described in detail. The impact of improper unit operation on the other processes should be emphasized.

Explanation of the operation principles is important so the operator will know what is to be done, how to do it, and why it is done.

The O&M manual should include background and theory that is easily understood by the operator for correct operation and control of the process. Additional references, which contain a complete and detailed explanation of the theory of wastewater treatment, can be provided in the appendices to the

O&M manual. It is imperative for the operator to have complete understanding of wastewater treatment principles in order to operate the treatment facility properly and effectively.

One of the operator's most important duties is process control. This section of the O&M manual must be carefully prepared and should be as complete as possible. The operational procedures should be described in great detail. It is important to present process objectives in the simplest terms for the operator to understand. Specific data for each process objective should be presented in a step-by-step procedure for the proper operation of the process. Process control guides must include a detailed description of the characteristics of a properly operating system including both laboratory characteristics resulting from sampling and testing and the sensory observations by the operator. This information will help the operator to determine if the process is operating properly.

The process control description should include a section on troubleshooting presenting:

1. Problem indicators
2. Probable causes
3. Determination of the cause by sampling, testing, monitoring
4. Corrective actions
5. Cross-reference to other sections in O&M manual
6. Possible references if an explanation is needed

This guide will assist the operator in recognizing a problem and determining the necessary corrective action.

The manual should include a description of routine maintenance procedures for each process. The maintenance procedures, either simple or complex, should be described in a step-by-step manner identifying tasks that the operating staff can do and those they should not do. When including the manufacturer's literature, care must be taken to assure that it meets the operator needs. The writer should extract data that covers only the equipment used in the facility. This section should also describe and discuss emergency operating and maintenance procedures for each process. The information in the maintenance section should be easily understood by the operator.

The O&M manual should include the following information on personnel:

1. Staffing plan for facility
2. Work organization plan
3. Shift and weekend staffing scheduling
4. Organizational structure

An essential part of the personnel section is a training plan. All training needs must be identified. The training budget should be equal to a sum of three to seven percent of the total O&M budget.

There should be a section on laboratory requirements explaining the laboratory needs, personnel requirements, and type of sampling, testing, and monitoring programs. All process control tests should be explained in a step-by-step procedure. Sampling procedures should be explained. One common weakness in this section is the lack of explanations of the results. The operators can run the control test, but if they do not know what the results mean, the procedure is wasted. The operator must recognize the need to compare the test results to other tests. The benefits of the use and interpretation of trend charts should be discussed in the O&M manual. The value of using process control test results to improve plant efficiency must be stressed. A complete record of the test results should be kept. A step-by-step manual on laboratory tests should be used as an attachment to the

O&M manual. This would reduce the O&M manual thickness. An excellent source of step-by-step manuals are those developed by NTOTC. The laboratory section should also include a laboratory quality control program.

Another section of the O&M manual explains the facility records and recordkeeping system. Laboratory results are a small part of the records needed at a treatment plant. The records that are kept depend upon operation and maintenance requirements and legal requirements. All forms needed should be identified and included in the manual.

The wastewater treatment facility needs to have a maintenance management system. The manual should describe and explain the particular system recommended for the facility in terms that can be understood by the plant operator. The benefits of a preventive maintenance program must be pointed out. The operator must be aware of the need to correctly perform all routine and preventive maintenance functions on a regular basis. The manual should include a maintenance checklist of items to be done, when to do them, how to do them, and how often they must be done.

Emergency operation procedures should be discussed in various sections of the O&M manual. However, the manual must contain an emergency response program to anticipate a variety of situations and present a response action for each emergency situation. There are several EPA publications providing adequate guidance on developing emergency response programs. The manual should include training programs or dry runs which are needed to inform the operator of the emergency response program and his/her responsibilities.

An important section of the O&M manual is safety. The wastewater treatment industry has a very poor safety record. An aggressive, effective safety program must be emphasized in the O&M manual. Even though safety is interwoven throughout the manual, a safety section is necessary. The manual should establish safety procedures for all operation and maintenance procedures performed. It should list, describe, and explain the use of all required and/or needed safety equipment. A safety training program should also be included in the O&M manual.

The O&M manual needs to contain a utilities section with a separate discussion of the complete system. The description should include the location (wire size, pipe size, etc.), routine maintenance, and responsibilities of plant staff or outside contractor. This section should include emergency or alternate utilities which need to be identified and located. The manual should describe the equipment that is and is not connected to the emergency or alternate utility. All procedures involved in changing from the normal utility system to the emergency system must be described including a step-by-step procedure of going from one source to the other.

Finally, the O&M manual should contain appendices which include all material that may be useful to the plant operator. This material is usually more detailed and complex than the manual itself and can be used by the operator as a reference for help in performing responsibilities properly.

O&M Manual Guidelines

The EPA's publication, Considerations for the Preparation of Operation and Maintenance Manuals, provides extensive guidance on the contents of an O&M manual. An outline for an O&M manual is included in the document (pages 14 through 38). This document contains extended notes and comments on each suggested chapter of the O&M manual. The appendices contain some excellent reference documents that all regulatory agency personnel need to improve their review. Use of this document will aid the preparer and reviewer in assuring that a usable O&M manual is produced that meets the requirements.

O&M MANUAL AND THE OPERATOR

Operator Needs in O&M Manuals

The operator should be given the opportunity to review and comment on the O&M manual prior to submission for approval. This will allow the operator to submit suggestions that can improve the manual. A letter from the operator should be sent with the manual to the reviewer. This procedure would improve O&M manual reviews.

From the operator's point of view, the manual should be divided into at least four sections. Each section would cover a specific topic: administration, plant operation, maintenance, and laboratory procedures.

The first section should be administration. This section would include an introduction, requirements and/or responsibilities of management, staffing personnel, operator training, public relations, permits and standards, safety, budget and costs, and an emergency operating and response program. This section would mainly be for administrative personnel but should also be available to plant operation and maintenance personnel.

The next section should cover plant operation. It must describe the operation of each process as it relates to the entire system. Operational procedures for normal, alternate, and common problems should be described in a step-by-step procedure. The control process as well as the process control test should be covered in detail, yet should be easily understood by the operator.

A section on maintenance is needed which should include detailed information on planning and scheduling, preventive maintenance programs, an equipment records system, a parts inventory system, lubricants and housekeeping, and maintenance personnel requirements. The various parts of this section must be explained fully and in a format that the maintenance personnel can understand.

The last section will contain information on laboratory procedures. This section should include a detailed description of the sampling, testing, monitoring, records, reports, and personnel requirements. This section should also include information on interpretation of test results. An explanation of the value of a data analysis sheet for determining trends is needed. This section should inform the operator of what type of results are expected from testing as well as what observations are expected of the treatment process.

In addition, the O&M manual should include a simplified diagram of all piping, valves, and controls, including enlarged detailed drawings of complicated piping areas. In many instances pictures should be included.

The manual should contain a schematic of the flow diagram of the treatment plant, not only for the wastewater flow, but for all flows such as air, gas, sludge, water, chlorine, potable water, etc. The manufacturer's daily, weekly, and monthly maintenance schedules should be summarized and cross-referenced to the page or pages of the manufacturer's manual.

Operator Problems with O&M Manuals

There are numerous problems with O&M manuals which range from format to lack of detail.

Many manuals are not usable because they do not provide the necessary data for the operator to operate the wastewater treatment plant. The reviewer and many O&M manual authors do not consider the needs of the operator. The operator should be able to use the manual as a reference on process control, maintenance procedures, troubleshooting, operating instructions on all equipment (pumps, motors, etc.), laboratory procedures, orientation to the plant, and as a training tool. Many O&M manuals do not meet this operator need and even when this need is met there are usually other problems that the operator faces in using the manual.

Some common operator problems with the manual are complex language, no instruction, only theory information, poor format, and lack of availability.

Many manuals are too complex for the operator. The data contained is for engineers, not operators, because the manuals are written by engineers and reviewed and approved by engineers with little concern for the user. Since many operators have less than a high school education the language may be too complex for them. Some may have had operator training, but others have not. The language used in an O&M manual must be simple, clear, and instructive to assist the operator in learning about the treatment plant. Any technical words or expressions must be clearly defined. Manuals should be written with step-by-step procedures for all operation and maintenance tasks to be performed.

In many instances the manuals are too lengthy which causes the operator to lose interest. The operator must be able to relate to the contents of the manual. The manual must be written for the specific wastewater treatment facility in which the operator works. General information and theory should be minimized and placed in a separate section from the operating data.

In order for plant operation and maintenance personnel to find the necessary information, the manual must be indexed so the information will be easy to find. Tabs on each section and subsection would be helpful in locating the information without going through the entire manual.

Availability of O&M manuals is another problem faced by plant personnel. Sometimes the manual is in the superintendent's office or another inaccessible location. If the manual is not available, it cannot be used. This could be solved by providing several copies for each facility or providing smaller "pocket-sized" copies that would be readily available to the user.

Through better communication with the plant operation and maintenance personnel, the engineers can produce a manual that can be understood and used by everyone. The manual should provide understanding, techniques, and references necessary to effectively operate and maintain the facility. The manual must be tailored to a specific plant and its equipment. The O&M manual is a reference book and must be flexible. The information in it must be changed and updated as time passes.

REVIEWING THE O&M MANUAL

The O&M manual review requires knowledge of the treatment process, itsfunctions and controls. The reviewer should consider the operator and the operator functions and responsibilities. The reviewer should evaluate the O&M manual to ensure that all requirements and operator needs are met.

The Audience

The target audience or user of the O&M manual must be identified. The audience may seem to be the operator, but this is not always the case.

The education, qualifications, skills, and background of the primary users of the O&M manual must be taken into consideration by the reviewer. The manual should be compatible with each user's skills and qualifications. The contents of each section, its details, etc., will also depend upon the user of the manual. The manual will be used as a guide for the expected job procedures; therefore the user must be identified, with determination of skills and reading levels to meet his/her needs. Achieving proper operation and maintenance will be difficult if the O&M manual cannot be read and understood by the user.

Improving Communication

There are many ways to improve the readability and usability of the O&M manual. One of the best ways is to simplify the language. The reviewer must consider two vocabularies when reviewing an O&M manual: technical and general.

A technical vocabulary has words and terms which are of a technical nature but are common and essential to the wastewater field. These words and terms must be in the manual, but each should be carefully defined when it is first used. Simplifying the language does not eliminate any of the technical terms but gives judicious and consistent use and proper definitions.

The general vocabulary has a simplified reading level which will make O&M manuals easier to read. This can be accomplished without any loss of technical details or information. Efforts to simplify the vocabulary are time-consuming but must be done if the O&M manual is to be readable. There are several word lists that can be used as a guide to predict the readability of an O&M manual. The reviewer should obtain one of these lists for use during the review of the O&M manual.

One example is the Clarence R. Stone Revision of the Dale Word List which contains approximately 1,000 words. According to Stone, the words are easily recognized by 80 percent of all fourth graders. The list was developed as an overall statistical device that can give a reliable prediction of the readability level. Using this list as a guide, the reviewer can determine the level of readability by determining the percentage of words used in the O&M manual that are not on the list.

Simplifying language is one way of improving readability in O&M manuals. In addition, the author should use simple sentence structure. Even the simplest vocabulary is difficult to read when long complex sentences are used. Complex sentences usually contain multiple ideas or concepts, while simple sentences contain one basic thought. Variety can still be achieved through the use of simple sentences and at the same time readability levels will be improved.

The use of illustrations (diagrams, charts, graphs, pictures, etc.) will clarify and simplify written information. The text must be correlated with specific illustrations.

The table of contents, index, and appendices make the manual more usable. An index enables the user to locate information easily while the table of contents divides the manual into sections. A subject index in the appendices is also helpful. Ease of information location greatly influences the level of use. Each section of the manual should pertain to one particular subject.

The O&M manual is the operator's principal source of technical information on the operation and maintenance of the wastewater treatment. The manual must be tailored to each plant and should be easy to read, brief, and concise. A well prepared O&M manual that is easy to read and use, that is brief, available, and routinely used by the operation and maintenance staff will help assure proper and efficient operation and maintenance of the treatment plant.

O&M MANUAL REVIEW CRITERIA

O&M Manual Submission

The O&M manual must be submitted for review and approval. A draft O&M manual must be submitted by the 50 percent payment date of a Step 3 grant. The final O&M manual must be submitted and approved by the 90 percent payment date of a Step 3 grant.

O&M Manual Review

The draft O&M manual should be reviewed as soon as possible in the Step 3 process.

The O&M manual checklist was designed to be applicable to all projects. Therefore, some of the items on the checklist may not be applicable for a specific project. Review criteria have been prepared for each subject on the checklist. The agency reviewer must be familiar with all review criteria before completing the checklist.

The checklist is designed in a two-part review and evaluation: (1) style and format and (2) content. The reviewer must consider the importance of both parts. When reviewing the O&M manual for operator usability (i.e., style, format, content, language, etc.), the reviewer should use the following criteria:

Review Criteria: Style and Format

1. Language:

   State certification requirements for educational levels, if any, should be considered. O&M manuals should be clearly written at a language level which is meaningful to required O&M personnel. Simple sentences should be used when possible.

2. Adaptation:

   It is imperative that each individual facility have an O&M manual prepared for its specific needs and requirements. By being plant specific the information presented in the manual can be applied directly to the appropriate facility.

3. Sections:

O&M personnel, administrators, and consultants differ greatly in their use of specific information included in the O&M manual. Manuals are of limited use to operators if they are bulky and unmanageable.

Sections written specifically for certain units of individual facilities should be furnished for individual operator use.

Therefore, division of the O&M manual into sections is strongly recommended.

4. Materials for Inclusion:

Textbook and standard material should not be included in the manual. This material should be referenced and available. A full set of as-built plans should be supplied to the grantee. These plans are not included in the O&M manual. Only those items which pertain to the specific facility should be incorporated into the manual.

5. Scope of Manual:

Manuals being written for the upgrading and/or expanding of an existing facility must address the operation and maintenance of the whole system (i.e. both existing and new facilities).

6. Updating the Manual:

O&M manuals should be open-ended, dynamic documents prepared in such a way that revisions are allowed to be made without difficulty.

Review Criteria: Content

The following criteria should be used when reviewing the O&M manual for content:

1. Introduction:

An O&M manual is a treatment system's primary reference book. It is essential that desired information be easily located. A user guide should supplement the table of contents and should explain the manual's organization and its intended use for personnel.

To ensure efficient and economical municipal wastewater treatment system operation, the responsibilities of both the operational personnel and the system's management must be clearly defined. The problems confronting each group must be identified by both parties.

The process-type description should be of an introductory nature and limited to two pages in the manual. Detailed descriptions of unit operations and processes are found in the description, operation, and control section of the manual. Detailed design criteria should be tabulated in the manual's appendix. A suggested format for this introductory description would be to categorize the treatment system by collection system, pretreatment, primary treatment, secondary treatment, advanced treatment, disinfection, and sludge handling. All units within each category should be briefly described.

A flow pattern should be in the introduction and should complement the plant description. It is not intended to illustrate all possible alternate flow paths in the system. Detailed flow diagrams and hydraulic profiles should be included in the engineering drawings of the facility.

The introduction of the O&M manual should include a:

a. Manual user guide
b. List of operator responsibilities
c. List of management responsibilities
d. List of available training
e. List of recommended general publications
f. List of specific publications furnished to the facility
g. Brief description of the general plant type
h. Basic flow diagram

2. Permits and Standards:

Personnel in responsible positions within a treatment system may not be aware that their facility is operating under a federal and/or state discharge permit. The facility's O&M manual is a convenient and practical location to maintain a copy of this permit with a discussion of the permit requirements. If operating personnel are aware of permit requirements, the possibility of permit violations occurring can be reduced.

The importance of having all treatment system personnel informed of the reporting procedures for spills of raw or inadequately treated wastewater cannot be overemphasized. Prompt reporting ensures spill cleanup and monitoring assistance can be dispatched to help minimize health hazards and environmental damage. Penalties for negligence in reporting these conditions are usually severe and could cause negative publicity for the treatment system.

Treatment system personnel often are not aware that a classification system exists for the body of water receiving their facility's treated effluent. Personnel should recognize the intended use of the receiving stream and the importance of maintaining a high performance level at the facility. The plant personnel should be able to relate their receiving stream's classification to the state's overall classification system.

The permits and standards section includes:

a. A general discussion of plant treatment requirements and effluent limitations
b. A list of the permits affecting the facility
c. Permit numbers and renewal dates

d. The summary of permit requirements
e. A discussion of the reporting procedure for spills
f. A discussion of the water quality standards for the receiving stream

3. Description, Operation, and Control of Project Facilities:

This section is the key element in the O&M manual because operating personnel can locate detailed descriptions of the unit operations and processes within their systems. Decisions made during plant start-up or when units are returned to service will be based on the information contained in this section. The flexibility designed into the treatment system is outlined and proves invaluable in correcting problems arising within the system.

This section should assist the operator in interpreting the construction drawings, the purpose and functions of the treatment plant, and the engineer's concept of operation and control of the wastewater treatment processes. Photographs and/or schematic diagrams are included to supplement the verbal description of routine, alternate, and emergency operations.

The following items should be discussed in this section for each unit process:

a. A general unit process description, function statement, and flow routing through the unit process and design efficiency

b. A listing of the major components and mechanical equipment

c. A discussion of relationship to adjacent units which includes the types and functions as they relate to the unit or process being considered

d. Methods of control including manual, automatic, physical, chemical, analytical, biological, and laboratory control measures

e. A discussion of common operating problems and controls explaining potential problems that are peculiar to the facility

f. Start-up procedures including inspection and adjustment of all equipment prior to start-up and outlines of the steps for placing the unit process in operation and information on special monitoring and controlling of the unit process until treatment objectives are met

g. Emergency shutdown procedures

h. The normal operation mode describing valve and gate positions, wastewater loadings, pump settings, speeds of rotating mechanical equipment, and process control variables

i. Alternate operational modes

j. Emergency operations and failsafe features including no bypass, peak flow capacities, standby power, and overload alarms

4. Personnel:

If a well-designed, well-constructed treatment facility does not have enough qualified personnel to operate the process, it cannot operate to its full capacity.

Up-to-date training for operators and maintenance personnel is necessary for the proper functioning of the wastewater treatment facility. Proper functioning protects the huge investment in plant equipment from damage or deterioration and improves the quality of the effluent.

EPA has developed three manuals ("Estimating Staffing for Municipal Wastewater Treatment Facilities," Contract No. 68-01; "Estimating Costs and Manpower Requirements for Conventional Wastewater Treatment Facilities," Contract No. 14-12-462; and "Estimating Laboratory Needs for Municipal Wastewater Treatment Facilities," Contract No. 68-01-0328) to provide assistance in estimating facility personnel requirements. The personnel section of the O&M manual includes:

a. A staffing and training plan to adequately prepare manpower recommendations, and a task analysis of each job within the treatment system. The staff requirements should be stated outlining individual areas such as supervision, administration, operation, and maintenance. If minimum staffing requirements have been established by the state agency for various size treatment facilities, the applicable requirement should be cited. Any state and federal training programs available at or near the treatment plant should be included.

b. Qualifications for all positions with job descriptions of each.

c. Details of state certification program if applicable, including a reference to the rules and regulations of the state certification board as a supplement to the O&M manual.

5. Laboratory Testing and Process Control:

The treatment system laboratory testing program provides the basis for process control and produces a record of procedures for operation of the treatment facilities. This information informs the operating personnel of plant efficiencies and helps analyze present problems and predict future problems. Laboratory test results are evaluated by governing and/or regulatory agencies as a record of plant performance. It is essential that a treatment system's laboratory testing program produce complete and accurate results.

To provide detailed information on laboratory equipment and staffing, EPA has developed a manual entitled "Estimating Laboratory Needs for Municipal Wastewater Treatment Facilities," Contract No. 68-0328, and published guidelines establishing approved test procedures for the analysis of pollutants in the Federal Register, December 1, 1976. The laboratory testing section includes:

a. A discussion of the sampling and testing program adapted to the laboratory staff capabilities of the facility under consideration. The sampling and testing program should include:

    (1) Sampling procedures and their frequency for the various laboratory tests.

    (2) Tests to be performed with a brief description for performing each test may be located in the reference laboratory document.

    (3) Definitions of important terms, such as grab sampling versus composite sampling.

    (4) A suggested schedule for performing various laboratory tests. The EPA manual entitled "Procedures for Evaluation Performance of Wastewater Treatment Plants," Contract No. 68-01-0107, contains a minimum process testing guide.

b. A detailed description of each test in controlling and/or monitoring specific treatment units, including expected test result ranges.

c. Samples of the recommended laboratory worksheets including a detailed discussion of the laboratory records.

d. A list of laboratory reference materials.

e. An inventory of laboratory equipment, supplies, and chemicals.

6. Records:

An important factor in any efficient wastewater treatment system is the maintenance of accurate operational and financial records. A record of past operational performances helps identify trends in any process. Operating cost records are essential to prepare accurate budgets. Accurate records permit plant operating personnel and management to maintain control of their facility.

The following are principal types of records:

a. Facility construction records list construction mishaps which could affect later operation.

b. A daily operating log bound in notebooks to prevent the destruction or alteration of the important records. The daily summary forms a basic data source for each day's entry on the monthly operating report.

c. State's required monthly report as it applies to the specific treatment system. (Sample forms should be provided in this section or in the manual's appendix.)

d. Annual reports, usually prepared by the treatment plant superintendent, are divided into two parts, a Management Data Section and an Operation Data Section.

e. A suggested operating cost breakdown for the treatment system and a record system for monitoring this cost. The major categories of operating costs are labor, utilities, chemicals, and supplies. (Labor is divided into operation, administration, and maintenance. Utilities include electricity, fuel oil, telephone, gas, and potable water. Chemicals are limited to those used in the treatment processes. Supplies include laboratory chemicals, cleaning materials, maintenance supplies, and other expendable items.)

f. Personnel records procedures reflect items such as training of individuals and employee turnover rate.

g. A system for maintaining a record of emergency conditions affecting the treatment facility records, bypass reports, and records of deteriorated effluent conditions.

h. NPDES reports

Other records such as laboratory maintenance and safety may be included, but detailed descriptions of these records should be provided in the specific sections of the O&M manual.

7. Maintenance Management Program:

The plant management's responsibility is to produce an acceptable effluent at the lowest unit cost and at the highest quality possible. The O&M manual should encourage a sound maintenance program by discussing the flexibility and limitations of the maintenance system. For additional assistance, the EPA has a manual entitled "Maintenance Management Systems for Municipal Wastewater Facilities," Contract No. 68-01-0341. The maintenance section of the O&M manual includes the following basic features:

a. Equipment record system containing the following information for each piece of equipment:

(1) Description and identifying number with location in plant. (Each item of equipment requiring maintenance should be assigned a number for easy identification and to help receive proper attention.)

(2) Supplier with address, representative, phone number, date of purchase, purchase price, and warranty provisions

(3) Size, model, type, and serial number

(4) Electrical and/or mechanical data

(5) Spare parts in stock and the procedure for ordering spare parts or replacements

(6) Preventive maintenance procedures and their frequency. (The manufacturer's catalog may be referenced, but should be supplemented with detailed maintenance guidelines specific to the applications.)

(7) Corrective maintenance requirements

(8) A system to compile expenses for future use in budget development. A catalog should be prepared that lists descriptions, locations, and numbers of equipment plus a preventive maintenance record and nameplate data card file system. This system may be one card or a number of cards for equipment, and possibly a combination of cards and data maintained on a computer for larger plants.

b. Miscellaneous maintenance records of preventive and corrective maintenance performed on nonequipment items including work description, manhours, cost, and date. Breakdown reports should be prepared when major problems are encountered.

c. Planning and scheduling involving time, personnel, equipment, and available money. Provisions should be made to allow time in the preventive maintenance schedule for such things as a lubrication schedule and housekeeping to perform corrective maintenance. A schedule chart with priorities of subjects, personnel, and time is a convenient aid to reduce unnecessary work. Maintenance duties should be scheduled to take advantage of good weather, low load or flow periods, and other variable conditions beyond the control of the operating staff. Critical equipment should be given maintenance planning priority.

d. Storeroom and inventory system consisting of a central storeroom for spare parts, equipment, and supplies which should be listed in a central catalog with assigned numbers. A purchase order system should also be established.

e. Special tool list and toolroom control providing recommendations on toolroom procedures, the use of tool boards, and maintenance skills required for all special tools. Tools should be stored in their area of use.

f. Maintenance personnel staffing requirements referring to the personnel chapter of the manual which provides job titles, job descriptions, and qualifications for maintenance personnel. Any general or specific information and limitations regarding maintenance personnel should be included.

g. System for cost accounting and budgeting guidelines for the determination of maintenance cost and development of maintenance budgets for eventual incorporation into the plant's total operation and maintenance budget. A filing system should be established to maintain a record of expenses.

h. Recommended list of outside contract maintenance tasks and firms considering plant size, complexity of equipment, and maintenance personnel qualifications.

8. Emergency Operating and Response Plan:

Emergency conditions can be imposed on a treatment system by natural disasters, strikes, civil disorders, and equipment failures. Therefore planning is essential to ensure continued effective operation during emergencies. An emergency operating and response program is required for each grant assisted plant in accordance with 40 CFR 35.935-12(b)(2). This program should be outlined in the corresponding chapter of the O&M manual. The objectives of this program are to:

a. Eliminate or minimize adverse effects from emergency situations affecting the treatment system

b. Develop procedures for properly responding to emergencies

c. Provide instruction for system personnel to identify their responsibilities during emergency situations

d. Provide inventories of available emergency equipment and outline existing mutual aid agreements and contracts with outside organizations for specialized assistance

EPA has developed two manuals, "Emergency Operating Procedures for Municipal Wastewater Treatment Facilities," and "Emergency Response Programs for Municipal Wastewater Treatment Facilities, State-Local Aspects" under Contract No. 68-01-0341, to assist in the preparation of local emergency plans.

The following basic features of this program outlined in the O&M manual are:

a. Vulnerability analysis which is an estimation of the degree to which the system will be disrupted compared to the function it must perform in an emergency situation. These results of the analysis will include a list of the most vulnerable components and a discussion of methods to reduce the treatment system's vulnerability.

b. Mutual aid list of the organization to be considered during emergency

c. Emergency equipment list

d. Records preservation outline of the program for the protection of essential records, maps, and inventories, including a list of the documents to be protected

e. List of industrial sources including the industrial contributors t the municipal treatment system, their location on a collection system map, the names and phone numbers, their key personnel, and a list of present potential hazardous spill materials

f. Police/fire coordination containing a checklist of items to consider

g. Detailed personnel assignments ensuring that all regular and auxiliary wastewater treatment system personnel recognize their tasks and responsibilities during emergencies, including procedures for occasional emergency response drills

h. Readiness/emergency response center description of the failsafe alarm system, including high water/power failure and critical equipment alarms, both for the treatment plant site and any remote pumping stations. A program should be established for placing emergency standby equipment into service periodically. This section designates the area that will serve as the emergency response center (normally the main building at the facility where the alarm system is located) and a list of the equipment and staffing requirements for this center.

i. Emergency operating plan listing possible emergency conditions and response plan actions. Process diagrams should describe bypassing of units during emergencies and locate problem areas when emergencies arise.

j. Spills and bypass reporting requirements and procedures

9. Safety:

The primary purpose of this chapter of the O&M manual is to help prevent personal injury to the treatment system staff. Treatment personnel should be able to recognize safety hazards and should be protected from these hazards to the greatest extent possible. Proper first aid training should be provided in the event an accident does occur.

The safety section of the O&M manual includes a discussion of the following items:

a. An emergency phone list including the numbers of several local physicians, the nearest hospital, police and fire departments, ambulance services, rescue squad, and process chemical suppliers

b. A safety equipment list

c. The following hazards discussing the treatment system (when applicable):

   1. Sewer hazards
   2. Electrical hazards
   3. Mechanical equipment hazards
   4. Explosion and fire hazards
   5. Bacterial infection
   6. Chlorine hazards
   7. Oxygen deficiency/gases
   8. Laboratory hazards
   9. Process chemicals handling
   10. Possible toxic waste influent

d. List of safety references of interest to operating personnel

e. A sample accident report form with the accident reporting requirements for the treatment system's insurance company

f. A periodic safety program review

10. Utilities:

The utilities serving a municipal wastewater treatment facility perform a major role in the proper operation of the facility. Frequent or prolonged interruptions of service can have significant effects, even on systems that have standby or alternate service. Identification of the size and capacities of the lines serving the facility and contact men within each utility company is essential for proper response to routine and emergency operations.

The O&M manual should include the names of utility suppliers with a description of their service. A brief statement on the reliability of each utility source and coordination during emergencies should be included. Many wastewater treatment plants have overlapping utilities; for example, the fuel used for heating the plant's control building may be either fuel oil, natural gas, or digestor gas. The conditions under which each fuel source is to be used should be described as follows:

a. Electrical

The voltage of the electrical service adjacent to the facility as well as the reduced voltage entering the plant should be stated. If standby power is provided from a second line, this system should be described. A detailed description of the power source should be included.

b. Telephone

Many alarm systems used in wastewater treatment operations utilize telephone lines; therefore, disruptions to telephone service should be minimized.

c. Natural gas

The cubic feet per hour and the normal operating pressure should be given for the gas lines servicing the facility.

d. Water

The size of the waterline serving the facility and operating pressure should be stated. If a pressure-reducing valve is used, its function and location should be explained. Any nonpotable water lines connected to the potable system using backflow preventer valves and onsite fire protection water supply should also be discussed.

e. Fuel oil

A schedule or method of ensuring adequate fuel supplies in stock should be outlined including capacities of fuel oil storage facilities at the treatment plant.

11. Electrical System:

The purpose of this chapter is to provide sufficiently detailed information on the treatment facility's electrical system to ensure efficient plant operation. Complete comprehension of the electrical system by plant personnel is essential because all operations involve some type of electric motor to power a pump, sludge collector mechanism, or aeration equipment. The electrical system should be described by a combination of schematic diagrams, tables, manufacturer's descriptive literature, and manufacturer's and contractor's detailed shop drawings. These documents can be filed and indexed with the indexing system described in the O&M manual. The following basic features of the electrical system should be included in the O&M manual:

a. A description of the power source including:

(1) Name of electric utility company

(2) Characteristics (voltage, overhead or underground, etc.) of primary distribution line serving the plant

(3) Description of the main transformer(s) (ownership, voltage, phase, connection, capacity, type, impedance, taps, etc.) as well as the physical location

(4) Types, ratings, and settings of protective devices

(5) Value of the maximum available short-circuit current at point(s) of service from the electric utility company

A properly noted one-line schematic diagram could present most of the above information with a supplement of the manufacturer's literature and shop drawings.

b. A description of the power distribution system (using a properly noted one-line schematic diagram) including:

(1) Service entrance equipment description (location, type of equipment, load capacity, short-circuit interrupting capacity, calculated short-circuit duty, voltage rating, etc.)

(2) Description of all motor control centers, distribution switchgear assemblies, panel boards, or other major components of the electrical system

(3) Tabulations of schedules of the components of the above equipment which indicate the power wiring and the loads fed by such components

c. Description of process monitoring and control instrumentation using appropriate schedules and tabulations indicating the type of controls and monitors and the process equipment involved. (Where involved sequences are present, schematic diagrams should be prepared.)

d. The alternate power source described in the same detail as the primary power source. If the alternate power system includes any duplicate power distribution equipment, this equipment should be described in the same detail as the power distribution system.

12. Appendix:

This section of the O&M manual is used for any additional or supplemental material not appropriately included in the text of the manual. Certain appendix items may be too bulky or cumbersome to be bound in the manual itself. These items should be bound separately or folded and placed in plastic dividers at the end of the manual. Several of the appendix subject areas are interdependent and the depth of content of any is substantially dependent on the content of the others.

The appendix should include the following items unless included elsewhere or not appropriate to the project:

a. Schematic including basic flow diagrams, process flow sheets, bypass piping diagrams, and hydraulic profiles to explain and illustrate treatment plant operation.

b. Methods of preparing valve indices including:

   (1) A complete tabulation of principal valves, each numbered separately and identified as to type, location, and function, with each appropriately field-tagged with a noncorrosive tag.

   (2) A coding system for each type of valve (plug, gate, throttling, etc.) together with a prefix or suffix identifying its liquid content or process function (raw sludge, return sludge, etc.) and each valve coded on the construction drawings.

   (3) A series of sketches for principal valves or clusters of valves and adjacent buried piping. This sketch permits immediate location by giving three lateral measurements to nearby permanent aboveground objects. This usually includes a tabulation of key characteristics such as size, type, year, direction and turns to open, depth to top of stem, valve box size and marking, process control, etc.

c. Sample forms including daily operating logs, NPDES reports, state monthly operating reports, equipment data cards, maintenance work orders, and purchase orders for supplies and equipment with instructions for completing each form.

d. Process chemicals/source listing all process chemicals needed and the names and addresses of chemical suppliers. An ordering schedule should be given to ensure adequate quantities are always in stock.

e. Detailed design criteria including capacities, flow rates, loading rates, detention times, unit dimensions, air requirements, recirculation rates, heat requirements, and chemical requirements for all unit operations and processes.

f. List of equipment suppliers including names, equipment furnished, and local representative.

g. Manufacturer's manuals furnished with each piece of equipment and included in the appendix or bound separately.

h. List of service and parts sources including types of repairs and equipment parts required by the treatment facility.

i. As-built drawings complete and accurate.

j. Approved shop drawings giving the detailed description of specialty items such as clarifier sludge removal mechanisms and anaerobic digester mixing mechanisms.

k. Dimension prints giving the actual relationship between installed equipment and adjacent walls and openings.

l. Construction photos giving special attention to underground or other concealed piping and diversion structures labeled and dated.

m. Warranties and bonds such as copies of equipment warranties, roof bonds, and the contractor's performance bond.

n. State O&M inspection form if the state is not using EPA Form 7500-5 for O&M inspections.

o. EPA Form 7500-5 assisting operational personnel in familiarizing themselves with the federal inspection criteria.

p. A copy of the enacted sewer use ordinance enclosed for the operator's information.

q. A copy of the industrial waste ordinance or discussion of other controls available.

r. Pretreatment controls/ordinances if the grantee has a pretreatment program and ordinance.

s. An outline of the piping color code system that is selected for use in the treatment system.

t. Protective coating list describing the various types of coatings to be used throughout the facility and giving a suggested painting schedule. The manufacturer's trade name and number and color should be specified.

u. A submitted sewer maintenance program addressing the following:

   1. The timely elimination of all excessive inflow sources originating from private sources which can be cost-effectively removed.

   2. The establishment of a continuing sewer maintenance program to ensure that the sewer system will not be subject to excessive infiltration/inflow in the future.

   Existing sewer maintenance programs should be reviewed for adequacy.

v. Map of collection system and lift stations indicating direction of flow, manhole locations, line sizes, and lift station capacities.

w. Service agreement.

There may be some overlap in the review criteria for style and format and content. This is unavoidable because the reviews are quite similar in nature and usually are conducted at the same time.

PROBLEMS THAT MAY DEVELOP IF O&M IS NOT CONSIDERED IN STEP 3

O&M consideration may be overlooked during the construction of a wastewater plant. Many problems that result from a lack of consideration for O&M in Steps 1 and 2 will extend into the construction phase. Some of the problems have already been discussed previously and will not be covered. However, some O&M problems that may develop are:

1. Lack of accessibility of underground piping
2. Blockage of hoist runways
3. Floors sloping away from drain pipe
4. Lack of or inaccessibility of meters and valves

During construction all underground piping should be clearly located. Care must be taken to avoid the placement of parking lots, buildings, tanks, etc., over the laid pipes. Under the guidance of the inspector the contractors must take steps to ensure that all piping is accessible.

Many traveling hoists have become useless because the I-beam has been blocked. The various contractors should coordinate their activities to prevent this problem from developing.

Standing water in many wastewater treatment facilities is a common problem to the operator. It is also a safety and health problem. Equipment is subject to flooding, causing operating problems. The contractor must ensure that all floors drain properly.

In many treatment facilities meters and valves are missing or are not accessible. This presents a real operating problem. Without any means (or if it is next to impossible to reach meters and valves) to regulate them, flow process control is impossible. Without process control plant operation is impossible.

APPLICATION STEP 3

REVIEW OPERATION CHECKLIST

			YES	NO	NA
1.	Does application contain approved plans and specifications?		___	___	___
2.	Plan of operation				
	a.	Has the preliminary plan of operation been approved?	___	___	___
	b.	Has an acceptable architectural-engineering subagreement or intended method of award been submitted for preparation of the final plan of operation?	___	___	___
	c.	Is the cost of the final plan of operation separately identified?	___	___	___
	d.	Is the proposed scope of the final plan of operation adequately defined?	___	___	___
	e.	Is the final plan of operation scheduled to be submitted prior to 50 percent completion of the construction project? (50 percent federal grant payment will not be made prior to approval of the final plan of operation)	___	___	___
3.	Does application form include:				
	a.	Legal authority of applicant to construct, operate, and maintain, and collect revenues needed for O&M of the proposed facility?	___	___	___
	b.	Properly signed assurances form (Part V Assurance) by applicant assuring proper O&M of the facility?	___	___	___
4.	Do proposed contracts and subagreements include:				
	a.	A scope of work sufficient to construct operable facilities?	___	___	___
	b.	Completion schedules which are reasonable and in agreement with plans and specifications and plans of operation (where applicable)?	___	___	___

		YES	NO	NA
5.	Have the following assurances (in addition to part V of application form) been included in the application?			
	a. Sewer use ordinance	___	___	___
	b. Operation and maintenance scheduling	___	___	___
	c. Sewer system rehabilitation scheduling	___	___	___
	d. Institutional agreements	___	___	___
	e. User charge system or a development schedule for its adoption	___	___	___
	f. Industrial use ordinance or schedule for development	___	___	___
	g. Pretreatment ordinance or schedule for development	___	___	___
	h. Industrial cost recovery system or a development schedule for its adoption	___	___	___
6.	Has applicant addressed O&M manual requirement?			
	a. Is preparation cost separately identified?	___	___	___
	b. What is the O&M manual preparation cost?	___	___	___
	c. Is completion schedule included?	___	___	___
7.	Does estimated O&M budget appear adequate?			
	a. What are the: 1. Annual O&M costs $____________ 2. Annual O&M revenues $____________			
	b. Are these cost and revenue estimates realistic?	___	___	___
8.	Does the staffing and training plan appear to be adequate?	___	___	___
	a. Staffing comment______________________________ ____			

	YES	NO	NA
b. Training comment________________________			
____			
c. Staff salaries comment____________________			
____			
d. Training funding comment__________________			
____			
9. Does the application include provisions for start-up services?	___	___	___
a. Has an acceptable subagreement (consulting engineer and/or equipment suppliers) or intended method of award been submitted for start-up services?	___	___	___
b. Does the start-up proposal include:			
1. Pre- and poststart-up personnel training?	___	___	___
2. Fine tuning to optimize process control?	___	___	___
3. Laboratory procedures?	___	___	___
4. Maintenance management system?	___	___	___
5. Records management system?	___	___	___
6. O&M manual updating?	___	___	___
c. For each of the above, does the approval include:			
1. Objectives statement?	___	___	___
2. Schedule for completion?	___	___	___
3. Estimated cost?	___	___	___
4. Contractor/consultant (personnel who are actually going to perform the start-up services) qualifications statement?	___	___	___
d. Is the total start-up services proposal cost presented as a separate line item in the Step 3 application?	___	___	___

		YES	NO	NA
e.	Are start-up services to be provided by the grantee's design engineer or by a designated agent?	___	___	___

f. Estimated time frame for start-up services:

1. __________man-days
2. __________months

g. Estimated cost of start-up services:$__________

Recommendation of Step 3 Grant Award________

____

Signed:______________________________

Date:______________________________

PRECONSTRUCTION CONFERENCE

OPERATION CONSIDERATIONS FOR DISCUSSION

	YES	NO	NA
1. Was compliance with state and local law and ordinances discussed?			
2. Has a preliminary plan of operation been approved?			
3. Have start-up service provisions been approved?			
4. Has a completion schedule for the following been submitted:			
a. Final plan of operation			
b. Draft of O&M manual by 50 percent payment			
c. Final O&M manual by 90 percent payment			
d. Staffing and training			
1. Hiring of chief operator by 50 percent			
2. Training program developed and implemented prior to start-up			
5. Have requirements for the submission of the following been discussed:			
a. A user charge system			
b. Industrial cost recovery system			
c. Sewer use ordinance			
6. Were the requirements for adequate engineering supervision and inspection during construction discussed? (40 CFR 35.935-8)			
7. Have construction schedules/procedures been established to avoid raw sewage bypassing and other existing facility treatment disruptions?			

	YES	NO	NA
8. Have procedures been provided to protect and maintain equipment in storage and in place during construction, prior to plant start-up?	___	___	___
9. Have the influent characteristics upon which plans and specifications are based been confirmed through sampling and analysis by 50 percent completion of construction?	___	___	___
10. Was applicant informed that onsite inspections of construction activities will be held?	___	___	___
a. Will an interim inspection be held?	___	___	___
b. Will a final inspection be held?	___	___	___
c. Other inspections that inspectors deem necessary may be held.	___	___	___
11. Were changes in plans and specifications during construction approved by state and EPA prior to execution discussed?	___	___	___
12. Was grantee informed of its responsibilities under 40 CFR 35.935-1?	___	___	___

Signed_______________________________

Date_________________________________

NOTE: If a preconstruction conference is not held, mail this list to the grantee with a Step 3 grant offer letter.
The preconstruction conference should be a requirement prior to Step 3.
The preapplication and predesign conference materials should be reviewed again.

OPERATION AND MAINTENANCE MANUAL
QUALITY EVALUATION REPORT

1. During the review for quality evaluation the reviewer shall make comments on the following:

   a. Language: ______________________________

   ____

   b. Adaption: ______________________________

   ____

   c. Sections: ______________________________

   ____

   d. Materials for Inclusion: ______________________________

   ____

   e. Scope of Manual: ______________________________

   ____

   f. Updating the Manual: ______________________________

   ____

Signed: ______________________________

Date: ______________________________

O&M MANUAL REVIEW OPERATION CHECKLIST

(For Preliminary and Final O&M Manual)

	YES	NO	NA
1. For Step 3 grants, was draft submitted by 50 percent payment point?	___	___	___
2. For Step 3 grants, will final O&M manual be approved by 90 percent payment point?	___	___	___
3. For Step 3 grants, will O&M manual be updated under start-up subagreement/contract?	___	___	___
4. Is draft/final O&M manual clearly and simply written?	___	___	___
5. Does draft/final O&M manual incorporate (at no or nominal cost to grantee) sections from EPA technical manuals and other available reference?	___	___	___
6. Is draft/final O&M manual in looseleaf form, organized in a logical sequence to encourage use, refining, and updating?	___	___	___
7. Detailed review of the O&M manual.			
Note: This section is presented in an outline form as an aid to the reviewer.			
Does the O&M manual contain the following:			
I. AN INTRODUCTION AND MANUAL USER GUIDE			
A. Operation and Managerial Responsibility			
1. Operator responsibilities defined	___	___	___
2. Manager responsibilities defined	___	___	___
3. List of available training	___	___	___

	YES	NO	NA
4. List of recommended publications			
5. List of publications furnished to the facility			
B. Process Type Description			
1. Type of treatment process			
a. Brief description of major process			
b. Brief description of individual units			
2. Flow pattern with diagram			
II. PERMITS AND STANDARDS			
A. Treatment Requirements/Effluent Limitations			
B. List of Permits Affecting Facility (including NPDES, Corps of Engineers Section 10/404, etc.)			
1. Permit number and renewal date			
2. Permit requirements/regulations of permitting agency			
3. Reporting procedure for spills			
C. State Water Quality Standard For Receiving Stream			
III. DESCRIPTION, OPERATION, AND CONTROL OF PROJECT FACILITIES			
A. For Each Unit Process, General Coverage of the Following:			
1. Description, function, flow routing, and design efficiency			
2. Listing of major components and mechanical equipment			

	YES	NO	NA
3. Relationship to adjacent units	___	___	___
4. Methods of control	___	___	___
5. Discussion of common operating problems and control	___	___	___
6. Start-up procedures	___	___	___
7. Emergency shutdown procedures	___	___	___
B. For Each Unit Process, Specific Coverage of the Following:			
1. Normal operation (valve positions, sludge depths, etc.)	___	___	___
2. Alternate operation modes	___	___	___
3. Emergency operations/failsafe features	___	___	___
4. Operating procedures at start-up (low flow)	___	___	___
5. Operating procedures at design capacity	___	___	___
IV. PERSONNEL			
A. Staffing and Training Plan			
1. Supervision	___	___	___
2. Administration	___	___	___
3. Operation	___	___	___
4. Maintenance	___	___	___
5. Total personnel	___	___	___
6. Annual training	___	___	___
7. Laboratory training needs	___	___	___
B. Qualifications			
1. Training	___	___	___
2. Skills required	___	___	___

	YES	NO	NA
3. Experience			
4. Certification required			
C. Certification			
1. Copy state rules and regulations			
2. Certification requirements of facility			
V. LABORATORY TESTING AND PROCESS CONTROL			
A. Outline of Sampling and Testing Program Discussion of Purpose			
B. Discussion of Laboratory Results, Expected Ranges and Process Control Adjustments from Test Results			
C. Provision of Sample Laboratory Worksheets, Instructions, and Test Results Forms			
D. Recommended List of Laboratory References			
E. Laboratory Equipment, Supplies, and Chemicals Inventory			
F. Operating Cost Recordkeeping System Recommendations			
G. Personnel Record System Recommendations			
H. Emergency Conditions, Bypass Reports, Permit Violations, etc.			
I. Maintenance and Laboratory, If Not Provided Elsewhere			
VI. RECORDS			
A. General - Importance of Recordkeeping			
B. Facility Construction Records			

		YES	NO	NA
C.	Sample of Daily Operating Log of Process, Operations, Instructions	____	____	____
D.	Sample of Monthly Operating Report to State Agency and Instructions	____	____	____
E.	Sample of Annual Report Format	____	____	____
F.	Operating Cost Recordkeeping System Recommendations	____	____	____
G.	Personnel Record System Recommendations	____	____	____
H.	Emergency Conditions, Bypass Reports, Permit Violations, etc.	____	____	____
I.	Maintenance and Laboratory, If Not Provided Elsewhere	____	____	____
VII.	MAINTENANCE			
A.	Conceptual Description of Maintenance Program	____	____	____
B.	Equipment Record System	____	____	____
1.	Equipment numbering system	____	____	____
2.	Equipment catalog (configuration list)	____	____	____
3.	Maintenance record cards, instruction	____	____	____
4.	Nameplate data cards, all major equipment	____	____	____
5.	List of warrantied equipment, warranty provisions	____	____	____
C.	Miscellaneous Maintenance Records	____	____	____
D.	Planning and Scheduling	____	____	____
1.	Normal preventive maintenance schedule provided	____	____	____

	YES	NO	NA
2. Lubrication schedule and lubricant list	___	___	___
3. Emergency, corrective maintenance	___	___	___
4. Work order system and sample form	___	___	___
E. Storeroom and Inventory System			
1. Recommended list of spare parts	___	___	___
2. Procedures, stockroom inventory, sample forms and records	___	___	___
F. Special Tool List and Toolroom Control	___	___	___
G. Maintenance Personnel Staffing Requirements	___	___	___
H. System for Cost Accounting and Budgeting	___	___	___
I. Recommended List of Outside Contract Maintenance Tasks and Firms	___	___	___
VII. EMERGENCY OPERATING AND RESPONSE PLAN			
A. Objectives	___	___	___
B. Vulnerability Analysis	___	___	___
C. Mutual Aid List	___	___	___
D. Emergency Equipment List	___	___	___
E. Records Preservation	___	___	___
F. List of Industrial Sources (Including Monitoring and Response System)	___	___	___
G. Police/Fire Coordination	___	___	___
H. Personnel Assignment In Detail	___	___	___
I. Readiness/Emergency Response Center	___	___	___
J. Emergency Operating Plan	___	___	___
IX. SAFETY			
A. Importance of Safety Program	___	___	___

	YES	NO	NA
B. Content			
1. Emergency phone list			
2. Safety equipment list			
3. Sewer hazards			
4. Electrical hazards			
5. Mechanical equipment hazards			
6. Explosion and fire hazards			
7. Bacterial infection			
8. Chlorine hazards			
9. Oxygen deficiency/gases			
10. Laboratory hazards			
11. Process chemicals handling			
12. List of references			
C. Periodic Safety Program Review			
D. Accident Report Form			
X. UTILITIES			
A. List of Utility Suppliers			
1. Electrical			
2. Telephone			
3. Natural gas			
4. Water			
5. Fuel Oil			
B. Capacities, Limitations, Responsibility Coordination			
XI. ELECTRICAL SYSTEM			
A. Power Source Description			

		YES	NO	NA
B.	Distribution System			
C.	Control and Monitoring System			
D.	Emergency Procedures			
XII.	APPENDIX			
A.	Schematics			
B.	Valve Indices			
C.	Sample Forms			
D.	Process Chemicals/Source			
E.	Detailed Design Criteria			
F.	Equipment Suppliers			
G.	Manufacturer's Manuals			
H.	Sources; Service and Parts			
I.	As-Built Drawings			
J.	Approved Shop Drawings			
K.	Dimension Prints			
L.	Construction Photos			
M.	Warranties and Bonds			
N.	State O&M Inspection Form			
O.	EPA Form 7500-5			
P.	Sewer Use Ordinance			
Q.	Industrial; Ordinance/Control			
R.	Pretreatment Controls/Ordinances			
S.	Piping Color Code			
T.	Protective Coating List			
U.	Sewer Maintenance Program			
V.	Map of Collection System and Lift Stations			

	YES	NO	NA
W. Recommended References	____	____	____

Comments Attached: Yes____ No____ NA____

Implementation Dates and Reminders: Date

1. DOMM review comments sent to grantee ________
2. DOMM acceptance letter sent to grantee ________
3. DOMM certification (checklist) to EPA ________
4. FOMM review comments sent to grantee ________
5. FOMM approval letter sent to grantee ________
6. FOMM certification (checklist) to EPA ________

Reviewer Signature: ______________________________ (DOMM)
Draft O&M Manual

Date: ______________________________

Reviewer Signature: ______________________________ (FOMM)
Final O&M Manual

Date: ______________________________

START-UP
SERVICE
PROPOSALS

UNIT
5

UNIT FIVE

OBJECTIVES

Following the Unit Five presentation, the participant will be able to:

1. Discuss the planning, need, and use of start-up services.
2. Evaluate the training programs outlined in the start-up services proposal.
3. Determine the qualifications of the start-up service provider.
4. List services that are grant eligible for funding.
5. Utilize review criteria and checklist in determining start-up proposal funding eligibility.

UNIT FIVE

OUTLINE

I. START-UP SERVICE PROPOSALS 5- 4

  A. Start-Up Services Planning, Use, and Needs
  B. Start-Up Service Training
  C. Start-Up Service Provider
  D. Start-Up Services Funding and Eligibility

II. START-UP SERVICES REVIEW CRITERIA AND CHECKLIST 5-18

III. START-UP SERVICES OPERATION REVIEW CHECKLIST 5-21

START-UP SERVICE PROPOSALS

Start-Up Services Planning, Use, and Needs

The construction grants program provides funding for the planning, design, and construction of wastewater treatment plants, pumping stations, interceptor sewers, force-main sewers, and collector sewers. The primary function of these grant fundable items is to collect and treat wastewater to obtain specific conditions and limitations on the discharged effluent. The wastewater treatment facility must begin the effective treatment of wastewater from the first day of operation in order to meet these required conditions and limitations. The key to providing effective wastewater treatment is successful plant start-up. The reviewer must remember that start-up service as outlined by PRM 77-2 applies to all grant fundable facilities such as:

1. The treatment plant
2. Pumping station
3. Interceptor sewers
4. Force-main sewers
5. Collector sewers

Start-up does not just happen. It requires months of preparation. Step-by-step start-up procedures must be developed. All operating and maintenance personnel should be hired well in advance (6 months recommended) of start-up. Classroom and field training on specific plant systems and components must be held. O&M procedures must be completed and explained. All manufacturer's equipment training programs should be completed. The maintenance management system must be complete and functional. All of these must be done to assure an effective plant start-up.

Start-up may be defined as a series of events that lead to a stabilized routinely controlled unit process or plant. This includes prestart-up preparation, start-up of primary (if any) and secondary treatment units, chlorination facilities, laboratory procedures, sludge handling process and units, poststart-up training, and O&M manual revision and update.

Start-up of any wastewater treatment facility is a complex operation. It requires careful planning, effective coordination, and a detailed preparation to maximize the treatment plant's efficiency and minimize problems. The information contained in the start-up proposal should provide operation and maintenance personnel with the guidelines necessary to inspect and adjust all equipment prior to start-up. The start-up services should outline all steps for the placing of treatment units or processes in operation. It should also provide information on monitoring and controlling of the unit and/or process until treatment objectives are met. The start-up proposal should also tell what should be done to continue meeting treatment objectives.

Information contained in a start-up proposal should be tailored to meet the needs of the specific plant. Proposal for a 1 MGD activated sludge plant would be different, although similar, to those for a 20 MGD activated sludge plant. Careful consideration should be given to a start-up service proposal to ensure that no important activities are overlooked.

Start-up services will help assure that the wastewater treatment facility achieves operational objectives quickly and effectively. Successful plant start-up will assure that:

1. Design operational efficiency is achieved as quickly as possible
2. Control and related equipment problems are identified and resolved
3. Onsite instruction to personnel in details of the process and equipment of each particular plant is provided

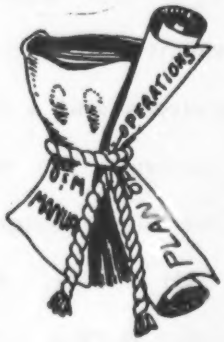
4. Final revision of the O&M manual, based upon actual operating experience, is made

These goals can only be met with a carefully planned and properly implemented start-up service plan.

Adequate consideration of plant start-up is essential to assure subsequent plant operation with a minimum of problems and to set the proper framework for long term, trouble free, efficient plant operation under all conditions.

In addition to assuring effective plant start-up, these services provide a very important use. Start-up services are needed because they pull the entire O&M program together before the closing out of Step 3 grants. Start-up services will ensure that the plan of operation has been implemented. The plan of operation identifies specific actions and related completion dates to assure that the wastewater treatment facility and all associated personnel are properly prepared for start-up and continued operation. The relationship of start-up services and the plan of operation is simple. One is a plan, the other is the tool to implement the plan.

Start-up is also part of the O&M manual. This provides the means of tying the O&M manual and plan of operation together. The O&M manual gives the detailed procedures for start-up. The plan of operation identifies specific actions and dates for start-up and continued operation. Start-up services provide the means for implementing the plan of operation using the information provided in the O&M manual.



This relationship provides all personnel associated with the O&M program (engineer, regulatory agency, plant personnel, owners, equipment suppliers, etc.) a chance to evaluate and correct (if needed) the entire O&M program for the wastewater treatment facility.

ULTIMATE CHALLENGE
DESIGNER

Start-up services are the designer's ultimate challenge. All phases of wastewater treatment must be brought into focus in a cost-effective and timely manner. The major objective for plant start-up is to achieve plant performance objectives quickly and efficiently. To meet this objective, start-up services must address the performance of the plant staff and the performance of the plant equipment.

Other issues that interact in achieving plant start-up objectives are a maintenance management program, plant management records system, laboratory support, process tuning, and O&M manuals.

Start-Up Service Training

Start-up training is twofold. First, the plant personnel are provided a broad knowledge of all processes, equipment, and instrumentation at the facility. The importance of process interactions and development of sound judgement and initiative are stressed. Staff training should produce strong supervisors and a highly qualified staff with a team approach to facility O&M.

Second, the designer can learn from the plant's O&M staff ways to improve plant design, plans and specifications, start-up procedures, training, and O&M manual. From the information obtained, the designer will be able to develop a more effective O&M program.

TRAINING
PROGRAM

The most important use of start-up services is as a training program. Meeting effluent performance requirements in a cost-effective and timely manner is the objective of plant start-up. Successfully starting up any wastewater treatment facility is a major task. It requires a training program that motivates and draws the full potential from plant personnel, that coordinates plant equipment operation to plant process operation, and that coordinates all other aspects of plant operation including:

1. Management
2. Maintenance scheduling
3. Laboratory controls
4. Use of O&M manuals

A brief review of the basic start-up elements is needed to understand the start-up training. These are:

1. Hire personnel
2. Establish the maintenance management system and train personnel in its use
3. Establish the laboratory procedures and train personnel in their use
4. Establish the records management system and train personnel in its use
5. Provide prestart-up training in
    a. plant operation
    b. plant maintenance
    c. plant supervision and maintenance
6. Check equipment and instruments

7. Start system with hands-on training
8. Fine tuning of systems and instruments
9. Revise plant O&M manual
10. Prepare first annual report

Each of the elements involves some degree of training because of the working relationship between plant personnel and start-up service personnel.

Much of this training may be carried out by equipment suppliers and contractors. The quality of this training, however, is dependent upon the requirements contained in the plans and specifications. The design engineer must be specific in the type of service wanted. The specifications should require that the equipment supplier and/or contractor provide:

1. Mechanical start-up services
2. Process start-up services
3. Training of plant personnel

To obtain these services the designer should state what is required in terms of personnel and time. This training can go a long way in making the wastewater treatment facility function properly.

There are basically three elements to any effective training program:

1. Preparation
2. Delivery
3. Followup

Preparation should begin early in the design phase. At this time, staffing estimates, start-up operating concepts, and construction scheduling are finalized. The preliminary plan of operation has been prepared, outlining start-up and training activities. A draft of the O&M manual should be prepared at this time as well.

During the construction phase, the final O&M manual and plan of operation are begun. A start-up training schedule must be coordinated with the O&M manual. The trend in start-ups has been towards a phased approach. As construction is completed, the start-up training is begun. So the O&M manual author must develop those sections needed for consideration with start-up training.

During program preparation the trainer should meet with the plant staff. At this meeting the trainer will develop basic training program outlines. The trainer must become familiar with plant personnel and their backgrounds. This will enable the trainer to target the training program to meet their needs. The trainer will also determine what type or style of delivery is needed. The trainer may, at this time, develop the plant's reference library and order the required items. As these training programs are developed and refined, they will become part of the plant's O&M manual.

The delivery of the program is very important. The delivery must be in a manner that is easily understood by the participants. The instructor must have both training and technical expertise. The presentation should be short and informal and the participants should be involved and interact as much as possible. Although the training is on site, the delivery should be a combination of classroom and hands-on training. A pure lecture approach to training is not very effective.

After the training program has been delivered the start-up service trainer must implement a followup program. The importance of a followup program is almost never considered. Start-up services must provide more than just well-trained staff and efficient operation. The turnover rate at most wastewater plants is very high. The shortage of well-trained, qualifed operating personnel in the wastewater field is becoming worse. To help the plant deal with this problem, the start-up service provider must establish a followup system to provide the plant with an ongoing training program for new personnel. A training officer should be appointed to accept the responsibility for the training program. There should be some type of reward or incentive for new and old employees to increase their skills and knowledge of treating wastewater.

Start-up training is customized training provided by a consultant. To be effective, time and effort must be spent in preparation. The delivery must be appropriate to fit the needs of the plant and its staff. Training should be evaluated to determine if the expected learning outcomes were achieved. A followup program is a must to provide ongoing plant training. The benefits of a good start-up are tremendous. The plant that has a poor start-up program will pay the price for many years to come.

Start-Up Service Provider

Who should perform the start-up services for the plant? Program Requirements Memorandum (PRM 77-2) states: "To be grant eligible, the services must be rendered by the design engineer or other identified by the design engineer." This places the design engineer in the driver's seat to provide or direct start-up services. The design engineer does appear to be the most logical person to provide site-specific start-up services. The engineer designed the plant, is instrumental in O&M manual development and plan of operation, and knows more about the plant and its performance objectives than anyone. The knowledge of the design engineer is very important to plant start-up. However, this is not enough. Since start-up services are a training function of the provider, it is very important that the engineer have training expertise equal to or exceeding his/her technical expertise. The engineer's knowledge of the plant and its performance objectives are of little use to others if it cannot be successfully communicated to them.

The requirement found in PRM 77-2 seems logical, at first glance, to provide proper and effective start-up services. Further investigation reveals flaws in PRM 77-2. It does not assure that proper and effective start-up services are provided. PRM 77-2 does not address the "qualifications" needed to develop, deliver, and follow up an effective start-up program. Having qualified personnel to coordinate start-up services is very critical. The provider must have the expertise to utilize the various tools of the training profession and must be able to respond to a variety of attitudes and educational conditions found at the treatment facility. The provider must have the resources to provide special manpower or technical support as needed.

When selecting a start-up service provider (other than design engineer) the grantee should look for the following:

1. Specialized experience and technical competence
2. Past record and performance on fullfilling contractual obligations
3. Capacity to perform the work required within time limitations (the firm's current workload must be considered)
4. Familiarity with the types of problems applicable to the project
5. Avoidance of conflict of interests
6. Philosophy on community development (which may conflict with the applicant's philosophy)
7. Training expertise
8. Additional resources to meet special training needs
9. Past performance on providing start-up services

10. Completion times
11. Cost overruns

In summation, effective start-up depends upon both technical knowledge and the ability to communicate. Without both, the goal of meeting the objective effluent performance requirements in a cost-effective and timely manner will not be reached.

Start-Up Services Funding and Eligibility

Construction Grants Program Requirements Memorandum (PRM 77-2) identifies specific services rendered during the start-up period of a wastewater treatment facility that are eligible for grant funding. These services will help assure that wastewater treatment facilities achieve operational objectives rapidly and effectively.

EPA, in response to the need for more emphasis on the operation and maintenance of federally funded wastewater treatment facilities, has determined that the costs of certain start-up services are eligible for funding. Such start-up services must assure that:

1. Design operation efficiency is achieved quickly
2. Process control and equipment problems are identified and resolved
3. Onsite instruction of personnel on the process and equipment is provided
4. The O&M manual is revised and updated

To be eligible for funding, the start-up services must meet the following terms and conditions:

1. Pre- and poststart-up personnel training--i.e., onsite training given plant operation and maintenance personnel on the operation and control of the specific treatment processes of the facility as

well as specialized training required for the safe operation and maintenance of plant equipment. It could also include consultation on the staffing and training plan before completion of construction. Such consultation would be supplemental to the O&M manual and intended to give plant personnel a clear understanding of individualized operational and management responsibilities. Grant eligible training and related consultation are not to be substituted for routine, entry-level or update operator training, the funding of which is the responsibility of the grantee.

2. Fine tuning to optimize process control--i.e., expert operational assistance for adjustment and fine tuning of the treatment processes and related equipment functions to optimize performance, safety, and reliability under actual operating conditions. This should include the detailing of operational procedures under both normal and abnormal conditions so as to achieve consistent, reliable, and efficient peformance from each process component at all times.

3. Laboratory procedures--i.e., onsite training and instruction to assure that the sampling and laboratory testing program needed for satisfactory process control and regulatory monitoring and reporting are fully understood. Entry-level or update training in basic laboratory testing and procedures for routine analyses are not grant eligible, although training in unique testing requirements related to some unusual unit process equipment may be determined to be grant eligible.

4. Maintenance management system--i.e., start-up services to assure effective implementation of the maintenance management system

outlined in the facility's O&M manual. Included is training of the operation and maintenance staff in the details of the maintenance management system to establish and maintain a preventive maintenance program.

5. Records management system--i.e., services to provide the training needed to implement a records management system as outlined in the O&M manual. It will become a major element in the larger and more complex plants that require a refined system to adequately handle records related to process control, effluent quality monitoring and reporting requirements, inventories for chemicals, supplies, and spare parts, etc.

6. Revise O&M manual--i.e., revising the O&M manual based upon actual operating experience obtained during the start-up period. It is not intended to replace the present requirements for drafting and finalizing the O&M manual before plant start-up, but does recognize that some aspects of plant operation and process control can be documented more fully after a period of actual plant operation.

In addition, grant eligible start-up services will average 90 man-days for most treatment plants. For large or complex plants, however, grant eligible start-up services may range up to 300 man-days. Start-up services shall be completed within a period of twelve months. In addition to grant eligible start-up services, grantees, in most cases, should be encouraged to negotiate separate agreements for technical and training services to identify and solve operational problems beyond the initial start-up period. However, only that period of time which conforms with guidance provided herein will be eligible for grant assistance.

Grant eligible start-up services are limited to those items described above. (Other services proposed for grant eligiblity will be considered only on a case-by-case basis by the regional administrator.) The extent of such services will depend on the size and complexity of the facility and the capabilities of existing or new operational and management staff. In many cases, services to address the potential needs above may be coupled with other related services. To be grant eligible, the services must be rendered by the design engineer or others identified by the design engineer. Services that do not meet these assurances, terms, and/or conditions are not grant fundable.

Start-up service participation is optional. If grant participation is desired, then the following must be done:

1. The design engineer must submit a proposal. Proposals for start-up services will be submitted with the Step 3 grant application.
2. The design engineer shall provide all services or certify a subcontractor who is qualified to provide the service.
3. The start-up services should be under the supervision of a certified operator at the level of certification which is required of the operator of that treatment facility.
4. Start-up service proposals will be approved and certified by the state agency and/or EPA for approval.
5. Proposal will contain service requested, course curriculum or training outline, persons providing services and their operational and training qualifications, and the number of days needed to accomplish each task.
6. Proposal will contain a cost breakdown of the services requested.

7. Start-up services will be completed within a period not to exceed 12 months from the time the plant commences actual operation treating domestic sewage. If prestart-up personnel training is required, the period, not to exceed 12 months, will commence at the time this training begins.

In summation, start-up services provide the means to achieve the goal of meeting effluent limitations in a cost-effective and timely manner. Those services must be tailored to a specific plant and its staff's needs. Personnel providing the start-up service must have:

1. Technical expertise
2. Training expertise
3. An operations background
4. Resources to call upon for additional manpower or technical support

Plant performance will suffer greatly if the grantee does not participate in start-up services. The long term benefits of participation in a good start-up program far outweigh any additional effort and costs the grantee may incur. The lack of a good start-up program will cost the grantee for many years to come.

START-UP SERVICES REVIEW CRITERIA AND CHECKLIST

Using the review criteria and the Start-Up Services Review Operation Checklist contained in this manual (page 5-21), the reviewer will be able to ensure that the start-up service proposal contains the following information and conforms to PRM 77-2.

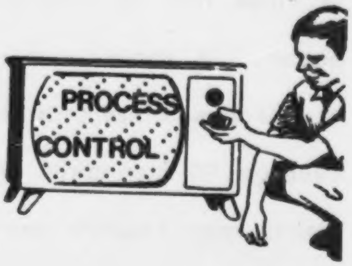
During the review the reviewer must ensure that the start-up service proposal contains the following:

1. Prestart-Up and Poststart-up Personnel Training

This includes onsite training given plant operation and maintenance personnel for specific and specialized treatment processes of the facility.

Consultation for a staffing and training plan before completion of construction may also be considered. However, grant eligible training and related consultation are not to be a substitute for routine, entry-level or update operator training, the funding of which is the grantee's responsibility.

2. Fine Tuning to Optimize Process Control



This means expert operational assistance for adjustment and fine tuning of the treatment processes and related equipment functions. Fine tuning must be based on actual operating conditions and detail the operational procedures to achieve consistent, reliable, and efficient performance from each process component at all times. It should also include operating procedures under both normal and abnormal conditions.

3. Laboratory Procedures

This includes onsite instruction to assure that the sampling and laboratory testing program for regulatory monitoring and reporting are understood. Training for routine analysis is not grant eligible, but training in unique testing requirements related to some unusual unit process or process equipment may be determined eligible.

4. Maintenance Management System

Training of the operation and maintenance staff in details of the maintenance management system to establish and maintain a preventive maintenance program is to be included.

5. Records Management System

Services to provide the training needed to implement a records management system are to be included. The records to be maintained are those related to process control, effluent quality monitoring and reporting requirements, inventories for chemicals, supplies, spare parts, etc.

6. Revision of O&M Manual

The O&M manual is to be revised based upon actual operating experience obtained during the start-up period.

The proposal must contain a completion schedule indicating that the services will be completed within 12 months from start-up or date services began. It should also include the number of man-days required to accomplish the proposed start-up services. Grant eligible start-up services will normally average 90 man-days for most treatment facilities. Larger or more complex plants may require more. The total number of allowable man-days may be increased to 300.

As stated earlier, a start-up service proposal must be presented as a separate line item. This is necessary to judge the cost-effectiveness of the proposed services.

The proposal must include who is to perform the start-up services and that person's qualifications. These should include:

a. past experience

b. past training programs

c. technical background

d. training background

e. operations background

f. resources to do the required tasks.

The start-up services proposal must assure that:

a. design operational efficiency will be achieved in a cost-effective and timely manner

b. process control problems and related equipment problems are identified and corrected

c. onsite training of personnel in the details of process and equipment operation will be provided

d. O&M manual will be updated based upon actual O&M experience

After determining if the start-up services meet all requirements, the reviewing agency may then approve the proposal. A letter of approval is sent to the grantee stating that the start-up services proposal has been accepted and approved.

START-UP SERVICES

OPERATION REVIEW CHECKLIST

	YES	NO	NA
1. Did the Step 2 grant application include a commitment to prepare start-up provisions?	___	___	___
2. Did the Step 3 grant application include clearly defined start-up provisions in a cohesive proposal?	___	___	___
3. Do proposed start-up services include:			
a. Pre- and poststart-up personnel training; including onsite training?	___	___	___
b. Fine tuning to optimize process control?	___	___	___
c. Laboratory management training?	___	___	___
d. Maintenance management training?	___	___	___
e. Records management training?	___	___	___
f. O&M manual revision?	___	___	___
4. a. Will start-up services be accomplished within 12 months after start-up?	___	___	___
b. How many man-days are required to accomplish proposed start-up services? __________ days.			
5. Is start-up presented as a separate line item?	___	___	___
6. Is the start-up service provider qualified?	___	___	___
7. Do proposed start-up services assure:			
a. Design operational efficiency will be achieved quickly?	___	___	___
b. Process control problems and related equipment problems are identified and resolved?	___	___	___
c. Onsite instructions to personnel in the details of process and equipment of plant will be provided?	___	___	___

d. That revisions to O&M manual will be based upon actual operating experience? ___ ___ ___

8. Summary____

____

____

Signed____________________

Date____________________

INSPECTIONS

UNIT
6

UNIT SIX

OBJECTIVES

Following the Unit Six presentation, the participant will be able to:

1. Identify and discuss the three basic types of inspections:
    a. Construction (onsite)
    b. O&M concerns
    c. O&M evaluation
2. Discuss the Army Corps of Engineers' role in inspections.
3. Discuss the kinds of construction inspections and list what is required by each.
4. Conduct an O&M considerations inspection to ensure that all of the O&M requirements in the construction grants process are being met or have been met by the grantee.
5. Utilize the interim and final construction operation review checklist when conducting an operation review.
6. Explain the enforcement procedures that may be used when it has been determined that the grantee has failed to comply with all applicable laws, rules, and regulations and all other attempts to resolve the problem(s) have failed.
7. Discuss the need to develop an inspection information feedback system.

UNIT 6

OUTLINE

I. INSPECTIONS 6-4

- A. Types of Inspections
- B. Corps of Engineers' Role in Inspections
- C. Construction Inspections
- D. O&M Considerations Inspections
- E. Enforcement Remedies

II. EVALUATION OF O&M 6-10

- A. Application
- B. Use of Inspection

III. INSPECTION FEEDBACK 6-13

- A. Introduction
- B. Importance
- C. Purpose
- D. Sources of Feedback
- E. Incorporating Feedback into the Construction Grants Process

IV. INTERIM CONSTRUCTION INSPECTION REVIEW OPERATION CHECKLIST 6-17

V. FINAL CONSTRUCTION INSPECTION REVIEW OPERATION CHECKLIST 6-19

INSPECTIONS

Types of Inspections

There are three basic types of inspections. They are the:

1. Construction Inspection (onsite)
2. O&M Program Considerations Inspection
3. Evaluation of Operation and Maintenance of Wastewater Treatment Plants

Each inspection is equally important to proper plant performance.

Corps of Engineers' Role in Inspections

In many states the Corps of Engineers conducts inspections. These inspections may be:

1. A review of plans and specifications for constructability
2. Onsite inspections during construction

The extent of the Corps of Engineers' responsibilities during the inspection process depends upon the agreements between the state and/or EPA and the Corps of Engineers.

Construction Inspections

Construction inspection (onsite) is based upon a time frame and can be divided into two kinds:

1. Interim
2. Final

The frequency of interim inspections depends upon the size and complexity of the project. This inspection may be a continuous one.

The final construction inspection is conducted following completion of construction.

The construction inspection processes start on the initial day of construction and end when the owner accepts the facility. Proper inspection ensures that the facility was built according to all approved grant documents and that sound construction principles have been followed.

O&M Considerations Inspections

All federally funded treatment works must have a well planned operation and maintenance program. Like the construction inspection, the O&M considerations inspection can be based upon a time frame and is also divided into:

1. An interim inspection
2. A final inspection

The interim inspection is conducted to ensure that all construction grants O&M requirements are being met by the grantee. The reviewer should use the Interim Construction Inspection Operation Checklist when conducting the review. This checklist will aid the reviewer in determining if the grantee has complied or is complying with the O&M requirements of the construction grants process. During the interim construction operation review, the inspector will determine that:

1. The preliminary plan of operation has been approved
2. Proof of completion of the final plan of operation has been submitted
3. The draft O&M manual has been submitted and approved
4. Proof of completion of the final O&M manual has been submitted
5. Start-up services have been approved
6. Provision for start-up is underway
7. The grantee has hired the operational staff and is providing training, as appropriate

8. The grantee is preparing a user charge and an industrial cost recovery system
9. The grantee is making satisfactory progress toward completion of service agreements
10. A procedure exists to call deficiencies (including design oversights) to the attention of the authorized representative
11. The grantee is providing wastewater treatment capability during construction
12. Equipment delivered to the site is being properly protected and stored
13. Influent characteristics have been confirmed
14. Design errors in plans and specifications have been corrected
15. Proof of completion of tasks specified in the preliminary or final plan of operation has been shown

The inspector should make notes on the progress of the grantee's compliance with O&M requirements. Deficiency areas should be corrected prior to the final inspection. The grantee should be reminded of payment schedules based upon compliance with O&M program concerns. An inspection conference can be helpful in reminding the grantee that compliance with O&M requirements is important not only for grant payments but for efficient plant performance in years to come.

After meeting all of the final inspection requirements, as construction permits, the project is ready for the final O&M considerations inspection. The inspector must ensure that all interim requirements are met. Additional requirements include:

1. Approval of the O&M manual
2. Approval of the final plan of operation
3. Completion of all elements of the plan of operation (see Plan of Operation Checklist, page 3-52)
4. Evaluation and correction of the grantee's O&M program as needed (the reviewer can refer to the checklist used during the various operational reviews)
5. Establishment of routine maintenance management
6. Availability of accounting records for audits
7. Completion of user charge system, sewer use ordinance, and service agreements if not already approved
8. Pretreatment of waste by industrial dischargers as required

The final inspection provides an opportunity for the reviewer to ensure that all O&M program requirements have been complied with. Final payment must be withheld until the grantee has complied with all O&M program concerns in an approvable manner. The O&M program enacted by the grantee will be evaluated; any weakness must then be corrected and reviewed again. Getting the plant started with an efficient O&M program will improve overall plant performance.

In reviewing the grantee's O&M program, the reviewer must utilize the PRM's, CFR's, and all previously discussed guidelines. An O&M program that ensures good plant operation and maintenance depends upon the reviewer, the design engineer, the owner, and the operator. If they all work together, plant O&M will be greatly improved.

Enforcement Remedies

If it is determined that the grantee has failed or is failing to comply with all applicable laws, rules, and regulations, the Regional Administrator can impose any or all of the sanctions found in 40 CFR 35.965 (Enforcement). Any deficiencies noted during the inspection process must be corrected promptly. Delay in correcting the deficiencies may cause the withholding of funds as directed by 40 CFR 30.615-3 (Withholding of Funds). This CFR authorizes the withholding of grant payment where it is determined that a grantee has failed to comply with project objectives, grant award conditions, or EPA reporting requirements.

STOP
WORK
ORDER

If the withholding of funds does not readily move the grantee into action then a stop work order may be issued in accordance with 40 CFR 30.915 (Suspension of Grants-Stop Work Orders). A stop work order is the first step in grant termination. The issuance of a stop work order means that there are serious problems associated with the grant and/or construction of the wastewater treatment plant (30.915-1, Use of Stop Work Orders).

If problems are not resolved after a stop work order is issued then steps can be taken to terminate the grant (40 CFR 30.920, Termination of Grants).

Another option is annulment of the grant rather than termination (40 CFR 30.920-5, Annulment of Grant). The grant can be annulled if the grantee fails to achieve the project purpose. In this event, monies paid to the grantee will be refunded to the EPA. In addition, the grantee may be found nonresponsible and ineligible for future EPA grant awards.

These enforcement procedures apply to both onsite inspections and O&M considerations inspections. In addition to these procedures, certain grant payment limitations may apply in the O&M considerations inspections process (i.e., the 50 percent, 80 percent, 90 percent payment requests) unless certain O&M requirements are met.

The deficiencies found during the inspection may be the contractor's fault. If so, the grantee must enforce the contractual agreement with the contractor. The grantee generally has certain remedies for enforcement (depending upon contract terms). If it becomes necessary the grantee may enlist the aid of EPA in enforcing their contractual agreements (40 CFR 35.910, Contract Enforcement).

It must be noted that the above enforcement remedies will be used only as a last resort. The use of these remedies must be cleared with the Regional Administrator or the Assistant General Counsel of Grants.

EVALUATION OF O&M

This evaluation is extremely important to facility O&M. It is conducted to determine whether the wastewater treatment facility is being operated efficiently and effectively in accordance with plant design.

This evaluation is a state responsibility. According to 40 CFR 35.925-10 Operation and Maintenance Program, and PL 92-500, no grant will be awarded unless the state water pollution control agency assures the regional administrator that the state will evaluate the operation and maintenance of each federally funded treatment works. The states will have an effective operation and maintenance monitoring program to assure that federally funded treatment works are operated and maintained according to applicable permit and grant conditions. This activity shall be clearly identified in the annual state plan submitted to EPA.

The inspection report (EPA Form 7500-5) shall contain the following as a minimum:

1. General information including the date of evaluation, plant identification and location, name of inspector and title, type of plant and collection system, and estimated total population served as well as industrial population equivalents served.
2. Plan loading performance data including average daily flow (MGD); peak flow rate for wet and dry weather (MGD); percent of daily industrial flow to plant; date, time, and volume of any wastes bypassing the plant; summary of laboratory analyses data on raw waste and final effluent and other significant unit processes.

3. Information on operating personnel including staff complement and qualifications of personnel in each job category, total manhours per week, number of state certified or licensed personnel, staffing deficiencies, staff vacancies, staffing needs not budgeted, training needs, and annual O&M budgets. Also included will be an identification and narrative of any facility problem traceable to personnel or training deficiencies.
4. An identification and brief discussion of significant operational problems or difficulties.
5. An evaluation and report on the facility including adequacy of operation and plant performance with regard to state and federal permit or other requirements, general housekeeping and maintenance adequacy, testing and reporting adequacy, and recommendations for corrective actions.
6. Appropriate additional operation and maintenance data and information pertinent to the conditions found at the plant or elsewhere in the sewage system at the time of inspection.

Every effort must be made to correct problems found during the evaluation inspection. The wastewater facility operator and owner should be given the necessary information, sources of technical help, and a reasonable time to correct the problem.

If all else fails, the enforcement provisions of PL 92-500 Section 309(a)(3), 309(b), and 309(c) must be invoked. A failure to invoke this enforcement provision has often existed in the past. Many wastewater treatment facility owners do not believe that any type of legal action will be taken against them. EPA must enforce all of its requirements if it expects proper and effective plant operation and maintenance.

The inspector conducting the O&M evaluation should become thoroughly familiar with the contents of the Inspector's Guide for Evaluation of Municipal Wastewater Treatment Plants, EPA 430/0-79-010.

Application

The need and requirement for inspections is not limited to the treatment plant itself. The inspection requirement applies to all grant fundable items such as:

1. Pumping stations
2. Interceptor sewers
3. Force-main sewers
4. Collector sewers

Use of Inspection

To aid all parties involved in the construction grants process. Feedback will help by:

1. Improving the review process by making it a more effective planning, design, and construction tool
2. Improving the design to construct facilities which are easier to operate and maintain
3. Aiding in selection of reliable consultants and contractors

The reviewer could develop a list of desirable characteristics for consultants and/or contractors for future grantees to use. This list could contain the following things for consideration:

1. Specialized experience and technical competence
2. Past record and performance on fullfilling contractual obligations
3. Capacity to perform the work required within time limitations (the firm's current workload must be considered)

4. Familiarity with the types of problems applicable to the project
5. Avoidance of conflict of interests
6. Philosophy on community development (which may conflict with the applicant's philosophy)
7. Review and compare all proposals
8. Evaluate other facilities' designs
9. Visit actual construction sites
10. Cost overruns
11. Change orders
12. Completion times

INSPECTION FEEDBACK

Introduction

A large amount of information on operation and maintenance of a wastewater treatment plant can be obtained during the inspection process. This information can be a valuable aid in improving the design, construction, operation, and maintenance of new and existing treatment plants. State water pollution control agencies and the EPA should develop a feedback system to get this data back to the design engineers, contractors, grantee, operators, maintenance personnel, inspector, etc. Participation in this feedback system should be mandatory.

The use of a formal feedback system by all individuals involved in the wastewater treatment industry yields many benefits and represents a tremendous step toward the improvement of plant performance.

Importance

Incorporating feedback from the inspection experience of existing plants into the design of new wastewater treatment plants can greatly improve a new facility's ability to meet its effluent standards. The use of a feedback system will aid the reviewer to enhance design features which improve plant performance and to eliminate the design deficiencies which detract from performance.

The inspector should make frequent visits to operating plants and plants under construction. The undesirable features of past design concepts can be brought to light in discussions with operators, construction field engineers, and start-up personnel. Operator concerns and client dissatisfaction can be detected, if they exist, by periodic visits and/or communications with the operator after plant start-up. These experiences can then be documented in writing and used as a basis for required changes in design that will improve facility O&M.

Purpose

The purpose of a feedback system should be to identify desirable design features as well as to avoid undesirable features. Many desirable design features can be incorporated into designs of new facilities based on plant inspection feedback. Determination of strong and weak features of plant designs can best be evaluated in light of direct plant inspection feedback. Many advances in the state of the art of plant design and equipment features have grown out of suggestions from operators, start-up personnel and resident representatives.

Sources of Feedback

Perhaps the most valuable single source of feedback is the information gained from plant inspections and O&M evaluations reports. The information obtained from these inspectors should be incorporated into the construction grants process.

Incorporating Feedback into the Construction Grants Process

Access to a readily usable system of feedback data is essential to ensure that the data will be used. There are a number of ways to accomplish this, including various filing systems and computer oriented data handling systems.

In addition the agency could:

1. Develop in-house memorandum
2. Conduct group discussions among inspectors and plans and specification reviews

3. Have inspectors present at preapplication, predesign, and/or preconstruction conference

INTERIM CONSTRUCTION INSPECTION

REVIEW OPERATION CHECKLIST

		YES	NO	NA
1.	Preliminary plan of operation submitted and approved with plans and specifications/Step 3 application.	___	___	___
2.	Evidence of progress for completion of final plan of operation for submittal and approval before 50 percent payment.	___	___	___
3.	Draft O&M manual submitted and approved by 50 percent payment.	___	___	___
4.	Evidence of progress for completion of final O&M manual by 90 percent payment.	___	___	___
5.	Start-up services subagreement/contract approved with Step 3 grant award.	___	___	___
6.	Provision for start-up underway.	___	___	___
7.	O&M personnel (e.g., chief operator) hired, trained, and certified.	___	___	___
8.	a. Have influent characteristics, upon which plans and specifications are based, been confirmed?	___	___	___
	b. Have errors in plans and specifications (i.e., design) surfaced during inspections?	___	___	___
	c. Have actions been taken to correct errors in the plans and specifications?	___	___	___
9.	Existing facility is in compliance with continuous treatment requirements of its discharge permit during construction.	___	___	___

	YES	NO	NA
10. Equipment maintained and protected both in storage and during construction.	___	___	___
11. Evidence of satisfactory completion of actions specified in the approved preliminary and final plan of operations.	___	___	___

12. Summary comment on grantee compliance with O&M requirements:

____

____

____

Signed: ____________________

Date: ____________________

FINAL CONSTRUCTION INSPECTION

REVIEW OPERATION CHECKLIST

		YES	NO	NA
1.	Final O&M manual approved and readily available to O&M plant personnel			
2.	Final plan of operation approved			
3.	All elements of the plan of operation are completed			
a.	Adequate staff on board			
b.	Staff is trained adequately or is scheduled for training			
c.	Records, reports, and laboratory control			
d.	Process control and start-up services			
e.	Safety			
f.	Emergency operating plan			
g.	Maintenance management			
h.	O&M manual			
i.	O&M budget			
j.	Other (e.g., sewer use ordinance, pretreatment ordinance)			
4.	Evaluation of grantee's O&M program			

Make entries: If further action or separate comment is required, circle item number and reference the circled number in supplemental comments.

PERSONNEL

a. Name, title, and telephone number of individual having primary responsibility for overall O&M: ______________________________

____

Minimum number of hours per day specifically assigned for this responsibility: ______________________________

Number of years of experience: ______________________________

Certified? __________ If No, what plans to remedy this? __________

____

Explain: ______________________________

____

____

____

b. Total number of operating personnel: ______________________________

c. Number certified: ______________________________

d. Is staffing consistent with O&M manual recommendation?

____

START-UP TRAINING

a. Are personnel familiar with the O&M manual? ______________________________

b. Who has provided them with related start-up instruction and supervision?

Name(s) and title(s): ______________________________

____

c. Are shift operators, laboratory technicians, and supervisory personnel familiar with effluent limitation and permit conditions? ______________

d. Do they know what this means in terms of operating the facility under all flow and load conditions? ______________________________

e. Is laboratory adequately equipped to perform necessary pretreatment, influent, effluent, and process control testing?__________________

f. Are daily logs maintained?________________ Are laboratory results recorded?__________________ Are monthly and other required reports submitted to the state?______________________________

g. What arrangements have been made for updating the O&M manual?______
____

h. What provisions have been made for annual O&M reports?____________
____

OPERATING PROBLEMS

a. Are there operating problems affecting plant performance?____________

b. Can they be solved without major construction?__________________

c. Does the staff have the necessary skills to solve these problems?______
____

d. Were solutions suggested?__________________________________

e. What followup actions(s) will be necessary?______________________
____

f. Is operating budget adequate?______________________________

g. Is maintenance program adequate?____________________________

OVERALL PLANT PERFORMANCE

a. Is plant operating at maximum design efficiency?__________________

b. What are influent flow characteristics (flow and load) as confirmed by sampling and analysis during construction?______________________
____
____

c. Comments on overall O&M program:____________________

____

____

d. Is plant in compliance with NPDES permit (including reporting requirements)? If not, what plans have been made to comply?__________

____

____

By grantee:________________________________

By state:__________________________________

By EPA:___________________________________

REFERENCES

REFERENCES

The following references used are available from:

General Services Administration (8FSS)
Centralized Mailing Lists Services
Bldg 41, Denver Federal Center
Denver, Colorado 80225

1. How To Obtain Federal Grants to Build Municipal Wastewater Treatment Works MCD-04 USEPA
2. Handbook of Procedures MCD-03, Construction Grants Program for Municipal Wastewater Treatment Works, February 1976 USEPA
3. Guidance for Preparing a Facility Plan MCD-46 USEPA
4. Model Plan of Study MCD-24 USEPA
5. Design Criteria for Mechanical, Electrical, and Fluid System and Component Reliability MCD-05 USEPA

The following references used are available from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

6. Consideration for Preparation of Operation and Maintenance Manuals, USEPA 430/9-74-001 price $3.10 Stock #055-001-00644-6
7. Start-up Services of Municipal Wastewater Treatment Facilities, USEPA 430/9-74-008 price $1.40 Stock # 055-001-0763-9
8. Estimating Staffing for Municipal Wastewater Treatment Facilities, USEPA price $3.00 Stock # 055-001-00569-5
9. Emergency Planning for Municipal Wastewater Treatment Facilities, USEPA 430/9-74-002 price $1.25 Stock # 055-001-00778-7
10. Estimating Laboratory Needs for Municipal Wastewater Treatment Facilities price $1.45 Stock # 055-001-0651-9
11. Federal Guidelines:
    Design of Wastewater Treatment Facilities, February 1976
    Inquiries pertaining to this document should be directed to:
    U.S. Environmental Protection Agency
    Office of Water Program Operations
    Washington, D.C. 20460

12. Federal Guidelines:
Operation and Maintenance of Wastewater Treatment Facilities
August 1974
Inquiries pertaining to this document should be directed to:
U.S. Environmental Protection Agency
Office of Water and Hazardous Materials
Washington, D.C. 20460

The following references are mentioned in the handbook:

13. Construction Grants Program Information, State and Local Pretreatment Program USEPA 430/9-76017ACB MCD-43. Available from:
United States Environmental Protection Agency
c/o GSA-Centralized Mailing Lists Services
Bldg. 41, Denver Federal Center
Denver, Colorado 80225

14. Emergency Operating Procedures For Municipal Wastewater Treatment Facilities, State-Local Aspects

15. Estimating Costs and Manpower Requirements for Conventional Wastewater Treatment Facilities USEPA, Project No. 17090 DAN Contract No. 14-12-462

16. Aspects Emergency Response Programs for Municipal Wastewater Treatment Facilities, March 1974

17. Maintenance Management Systems for Municipal Wastewater Facilities EPA-430/9-74-004, October 1973 (PDS #3998). Available from:
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

18. Water Pollution Control Federation Manual of Practice No. 3 (sewer use ordinances)

APPENDIX

REGULATIONS

1.	40 CFR 30.615-3	Withholding of Funds
2.	40 CFR 30.915	Suspension of Grants--Stop-Work Orders
3.	40 CFR 30.915-1	Use of Stop-Work Orders
4.	40 CFR 30.920	Termination of Grants
5.	40 CFR 30.920-5	Annulment of Grant
6.	40 CFR 33.410-9	Award to the Low, Responsive, Responsible Bidder
7.	40 CFR 35.835-7	Operation and Maintenance
8.	40 CFR 35.835-9	Postconstruction Inspection
9.	40 CFR 35.917-1(a)(d)(h)	Contents of Facilities Plan
10.	40 CFR 35.917-4(b)	Planning Scope and Detail
11.	40 CFR 35.917-5(a)	Public Participation
12.	40 CFR 35.920-3(a)	Contents of Application
13.	40 CFR 35.920-3(c)(3)	Contents of Application
14.	40 CFR 35.925-10	Operation and Maintenance Program
15.	40 CFR 35.927-4	Sewer Use Ordinance
16.	40 CFR 35.935-1	Grantee Responsibilities
17.	40 CFR 35.935-4	Step 2 and 3 Projects
18.	40 CFR 35.935-8	Supervision
19.	40 CFR 35.935-12	Operation and Maintenance
20.	40 CFR 35.935-14	Final Inspection
21.	40 CFR 35.965	Enforcement

40 CFR 30.615-3

WITHHOLDING OF FUNDS

(a) It is EPA policy that full and prompt payment be made to the grantee for eligible project costs. Except as otherwise provided by this subchapter, the EPA grant approving official may only authorize the withholding of a grant payment where he determines in writing that a grantee has failed to comply with project objectives, grant award conditions, or EPA reporting requirements. Under such conditions, the EPA grant award official will inform the grantee by written notice that payments will not be made for obligations incurred after a specified date until the conditions are corrected. Such withholding shall be limited to that amount necessary to assure compliance.

(b) The grant approving official may authorize withholding of payment to the extent of any indebtedness to the United States, unless he determines that collection of the indebtedness will impair accomplishment of the project objectives and that continuation of the project is in the best interest of the United States.

40 CFR 30.915

SUSPENSION OF GRANTS--STOP-WORK ORDERS

Work on a project or on a portion or phase of a project for which a grant has been awarded may be ordered stopped by the grant award official, except for grants to educational institutions or nonprofit research organizations.

40 CFR 30.915-1

USE OF STOP-WORK ORDERS

Work stoppage may be required for good cause such as default by the grantee, failure to comply with the terms and conditions of the grant, realignment of programs, lack of adequate funding, or advancements in the state of the art. Inasmuch as stop-work orders may result in increased costs to the Government by reason of standby costs, such orders will be issued only after concurrence by the grant approving official and the Regional Counsel or the Assistant General Counsel, Grants. Generally, use of a stop-work order will be limited to those situations where it is advisable to suspend work on the project or a portion or phase of the project for important program or agency considerations and a supplemental agreement providing for such suspension is not feasible. Although a stop-work order may be used pending a decision to terminate by mutual agreement or for other cause, it will not be used in lieu of the issuance of a termination notice after a decision to terminate has been made.

40 CFR 30.920

TERMINATION OF GRANTS

A grant may be terminated in whole or in part by the grant award official upon the recommendation of the Project Officer and after concurrence of the grant approving official in the proposed action and consultation with the Regional Counsel or the Assistant General Counsel, Grants.

40 CFR 30.920-5

ANNULMENT OF GRANT

(a) The grant award official may unilaterally annul the grant if the Project Officer determines, with the concurrence of the appropriate Assistant Administrator or Regional Administrator and the Regional Counsel, Grants, that:

(1) There has been no substantial performance of the project work without good cause;

(2) There is convincing evidence the grant was obtained by fraud; or

(3) There is convincing evidence of gross abuse or corrupt practices in the administration of the project.

(4) The grantee has inordinately delayed completion of the project without good cause; or

(5) The grantee has failed to achieve the project purpose (e.g., preparation of a research report) or to utilize the project (e.g., construction) to the extent that the fundamental purpose of the grant is frustrated.

40 CFR 33.410-9

AWARD TO THE LOW, RESPONSIVE, RESPONSIBLE BIDDER

(a) After bids are opened, they shall be evaluated by the grantee in accordance with the methods and criteria set forth in the bidding documents.

(b) The grantee may reserve the right to reject all bids. The basis for rejection must be stated by the grantee. Unless all bids are rejected for good cause, award shall be made to the low, responsive, responsible bidder.

(c) If award is intended to be made to a firm which did not submit the lowest bid, a written statement shall be prepared prior to any award and retained by the grantee explaining why each lower bidder was deemed not responsive or not responsible.

(d) If EPA Project Officer approval is required by a special condition of the grant agreement or by regulation, the subagreement shall not be executed until approval has been obtained.

(e) Bidders shall be notified of the winner promptly after bid opening.

40 CFR 35.835-7

OPERATION AND MAINTENANCE

No grant may be awarded unless the applicant has made provisions satisfactory to the Regional Administrator that the treatment works will be maintained and operated in accordance with such requirements as the administrator may publish from time to time concerning methods, techniques and practices for economics, and efficient, effective operation and maintenance of treatment works. Such provision shall include, but not be limited to, (a) an operation and maintenance manual, including emergency readiness plan, (b) properly trained personnel and (c) operational reports.

40 CFR 35.835-9

POSTCONSTRUCTION INSPECTION

No grant may be awarded unless the State water pollution control agency provides assurance satisfactory to the Regional Administrator that the State will inspect the treatment works not less frequently than annually for the 3 years after such treatment works is constructed and periodically thereafter to determine whether such treatment works is operated and maintained in an efficient, economic, and effective manner.

40 CFR 35.917-1(a)(d)(h)

CONTENTS OF FACILITIES PLAN

Facilities planning must address each of the following to the extent considered appropriate by the Regional Administrator:

(a) A description of the treatment works for which construction drawings and specifications are to be prepared. This description shall include preliminary engineering data, cost estimates for design and construction of the treatment works, and a schedule for completion of design and construction. The preliminary engineering data may include, to the extent appropriate, information such as a schematic flow diagram, unit processes, design data regarding detention times, low rates, sizing of units, etc.

(d) A cost-effectiveness analysis of alternatives for the treatment works and for the complete waste treatment system(s) of which the treatment works is a part. The selection of the system(s) and the choice of the treatment works for which construction drawings and specifications are to be prepared shall be based on the results of the cost-effectiveness analysis.

3. An evalution of improved effluent quality attainable by upgrading the operation and maintenance and efficiency of existing facilities as an alternative or supplement to construction of new facilities.

(h) A brief statement demonstrating that the authorities who will be implementing the plan have the necessary legal, financial, institutional, and managerial resources available to insure the construction, operation, and maintenance of the proposed treatment works.

40 CFR 35.917-4(b)

PLANNING SCOPE AND DETAIL

(b) Facilities planning shall be conducted only to the extent that the Regional Administrator finds necessary in order to insure that facilities for which grants are awarded will be cost-effective and environmentally sound and to permit reasonable evaluation of grant applications and subsequent preparation of designs, construction drawings, and specifications.

40 CFR 35.917-5(a)

PUBLIC PARTICIPATION

(a) General. Consistent with section 101(e) of the Clean Water Act and 40 CFR Part 25, EPA, the States, and grantees shall provide for, encourage, and assist public participation in the facilities planning process and shall provide citizens with information about and opportunities to become involved in the following:

1. The assessment of local water quality problems and needs;
2. The identification and evaluation of locations for wastewater treatment facilities and of alternative treatment facilities and alternative treatment technologies and systems including those which recycle and reuse wastewater (including sludge), use land treatment, reduce wastewater volume, and encourage multiple use of facilities;
3. The evaluation of social, economic, fiscal, and environmental impacts; and
4. The resolution of other significant facilities planning issues and decisions.

40 CFR 35.920-3(a)

CONTENTS OF APPLICATION

(a) Step 1: Facilities plan and related Step 1 elements. An application for a grant for Step 1 shall include:

1. A plan of study presenting:
   - (i) The proposed planning area;
   - (ii) An identification of the entity or entities that will be conducting the planning;
   - (iii) The nature and scope of the proposed Step 1 project and public participation program including a schedule for the completion of specific tasks;
   - (iv) An itemized description of the estimated costs for the project; and
   - (v) Any significant public comments received.

40 CFR 35.920-3(c)(3)

CONTENTS OF APPLICATION

(c) Step 3. Building and erection of a treatment works. Prior to the award of a grant or grant amendment for a Step 3 project, the applicant must furnish the following:

(3) A schedule for or evidence of compliance with 35.925-10 and 35.935-12 concerning operation and maintenance program, including a preliminary plan of operation.

40 CFR 35.925-10

OPERATION AND MAINTENANCE PROGRAM

If the award of a grant assistance is for a Step 3 project, that the applicant has made satisfactory provision to assure proper and efficient operation and maintenance of the treatment works (including sewer system) in accordance with 35.935-12 and that the State will have an effective operation and maintenance monitoring program to assure that treatment works assisted under this subpart comply with applicable permit and grant conditions.

40 CFR 35.927-4

SEWER USE ORDINANCE

Each applicant for grant assistance for a Step 2 or Step 3 project shall demonstrate to the satisfaction of the Regional Administrator that a sewer use ordinance or other legally binding requirement will be enacted and enforced in each jurisdiction served by the treatment works project before the completion of construction. The ordinance shall prohibit any new connections from inflow sources into the sanitary sewer portions of the sewer system and shall insure that new sewers and connections to the sewer system are properly designed and constructed.

40 CFR 35.935-1

GRANTEE RESPONSIBILITIES

(a) Review or approval of project plans and specifications by or for EPA is for administrative purposes only and does not relieve the grantee of its responsibility to design, construct, operate, and maintain the treatment works described in the grant application and agreement.

(b) By its acceptance of the grant, the grantee agrees to complete the treatment works in accordance with the facilities plan, plans and specifications, and related grant documents approved by the Regional Administrator, and to maintain and operate the treatment works to meet the *enforceable* requirements of the Act for the design life of the treatment works. The Regional Administrator is authorized to seek specific enforcement or recovery of funds from the grantee, or to take other appropriate action (see 40 CFR 35.965), if he determines that the grantee has failed to make good faith efforts to meet its obligations under the grant.

(c) The grantee agrees to pay, pursuant to section 204(a)(4) of the Act, the non-Federal costs of treatment works construction associated with the project and commits itself to complete the construction of the operable treatment works and complete waste treatment system (see definitions in 40 CFR 35.905) of which the project is a part.

(d) The Regional Administrator may include special conditions in the grant or administer this subpart in the manner which he determines most appropriate to coordinate with, restate, to enforce NPDES permit terms and schedules.

40 CFR 35.935-4

STEP 2 AND 3 PROJECTS

A grantee which has received Step 2 and 3 grant assistance must make submittals required by 40 CFR 35.920-3(c), together with approvable user charge and industrial cost recovery systems and a preliminary plan of operation. The Regional Administrator shall give written approval of these submittals before advertising for bids on the Step 3 construction portion of the Step 2 and 3 project. The cost of Step 3 work initiated before such approval is not allowable. Failure to make the above submittals as required is cause for involving sanctions under 40 CFR 35.965.

40 CFR 35.935-8

SUPERVISION

In the case of any project involving Step 3, the grantee will provide and maintain competent and adequate engineering supervision and inspection of the project to ensure that the construction conforms with the approved plans and specifications.

40 CFR 35.935-12

OPERATION AND MAINTENANCE

(a) The grantee must make provision satisfactory to the Regional Administrator for assuring economic and effective operation and maintenance of the treatment works in accordance with a plan of operation approved by the state water pollution control agency or, as appropriate, the interstate agency.

(b) As a minimum, the plan shall include provisions for:

1. An operation and maintenance manual for each facility;
2. An emergency operating and response program;
3. Properly trained management, operation, and maintenance personnel;
4. Adequate budget for operation and maintenance;
5. Operational reports;
6. Provisions for laboratory testing and monitoring adequate to determine influent and effluent characteristics and removal efficiencies as specified in the terms and conditions of the NPDES permit.

7. An operation and maintenance program for the sewer system.

(c) Except as provided in paragraphs (d) and (e) of this section, the Regional Administrator shall not pay:

1. More than 50 percent of the Federal share on any Step 3 project unless the grantee has furnished a draft of the operation and maintenance manual for review, or adequate evidence of timely development of such a draft; or
2. More than 90 percent of the Federal share unless the grantee has furnished a satisfactory final operation and maintenance manual.

(d) In projects where segmenting of an operable treatment works has occurred, the Regional Administrator shall not pay:

1. More than 50 percent of the Federal share of the total of all interdependent Step 3 segments unless the grantee has furnished a draft of the operation and maintenance manual for review, or adequate evidence of timely development of such a draft, or
2. More than 90 percent of the Federal share of the total of all interdependent Step 3 segments unless the grantee has furnished a satisfactory final operation and maintenance manual.

(e) In multiple facility projects where an element or elements of the treatment works are operable components and have been completely constructed and placed in operation by the grantee, the Regional Administrator shall not make any additional Step 3 payment unless the operation and maintenance manual (or those portions associated with the operating elements of the treatment works) submitted by the grantee has been approved by the Regional Administrator.

40 CFR 35.935-14

FINAL INSPECTION

The grantee shall notify the Regional Administrator through the State agency of the completion of Step 3 project construction. The Regional Administrator shall cause final inspection to be made within 60 days of the receipt of the notice. When final inspection is completed and the Regional Administrator determines that the treatment works have been satisfactorily constructed in accordance with the grant agreement, the grantee may make a request for final payment under 35.945(e).

40 CFR 35.965

ENFORCEMENT

If the Regional Administrator determines that the grantee has failed to comply with any provision of this subpart, he may impose any of the following sanctions:

(a) The grant may be terminated or annulled under 30.920 of this subchapter;

(b) Project costs directly related to the noncompliance may be disallowed;

(c) Payment otherwise due to the grantee of up to 10 percent may be withheld (see 30.615-3 of this chapter);

(d) Project work may be suspended under 30.915 of this subchapter;

(e) A noncomplying grantee may be found nonresponsible or ineligible for future Federal assistance or a noncomplying contractor may be found nonresponsible or ineligible for approval for future contract award under EPA grants;

(f) An injunction may be entered or other equitable relief afforded by a court of appropriate jurisdiction;

(g) Such other administrative or judicial action may be instituted if it is legally available and appropriate.